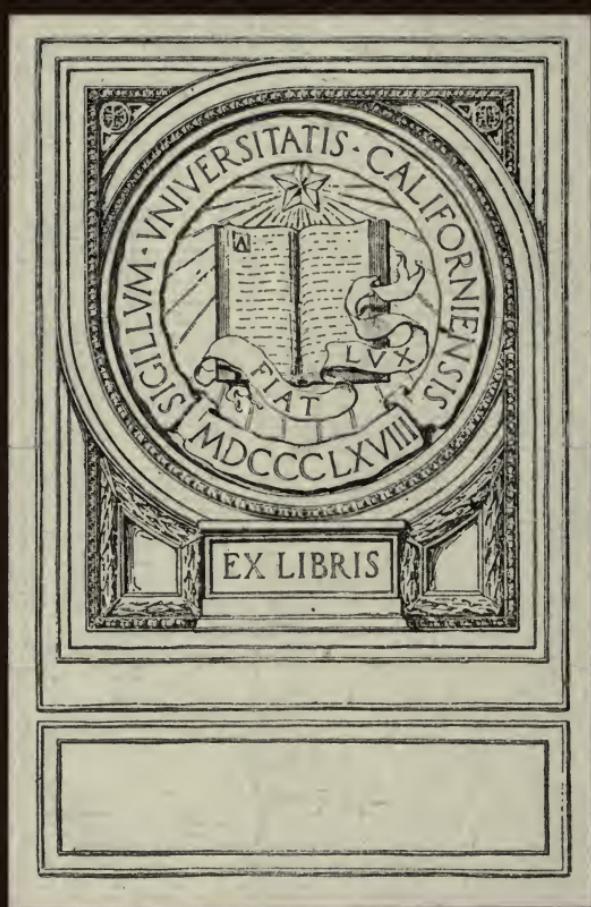


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MASSAGE IN
RECENT FRACTURES
SPRAINS AND THEIR CONSEQUENCES
RIGIDITY OF THE SPINE
AND THE
MANAGEMENT OF STIFF JOINTS
GENERALLY

LECTURES AND ESSAYS
BY
SIR WILLIAM H. BENNETT.

ON THE USE OF MASSAGE AND EARLY MOVEMENTS IN RECENT FRACTURES AND OTHER COMMON SURGICAL INJURIES. SPRAINS AND THEIR CONSEQUENCES, RIGIDITY OF THE SPINE, AND THE MANAGEMENT OF STIFF JOINTS.
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SIR WILLIAM H. BENNETT, K.C.V.O., F.R.C.S.

CONSULTING SURGEON TO ST. GEORGE'S HOSPITAL
AND TO THE HOSPITAL OF ST. JOHN AND ST. ELIZABETH
SENIOR SURGEON TO THE SEAMEN'S HOSPITAL, GREENWICH, ETC.

FIFTH EDITION

WITH 23 ILLUSTRATIONS

LONGMANS, GREEN, AND CO.
39 PATERNOSTER ROW, LONDON
NEW YORK, BOMBAY, AND CALCUTTA
1910

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BY

BIBLIOGRAPHICAL NOTE

<i>First printed</i>	<i>October, 1900</i>
<i>Second Edition</i>	<i>April, 1902</i>
<i>Third Edition</i>	<i>June, 1903</i>
<i>Fourth Edition</i>	<i>April, 1909</i>
<i>Fifth Edition</i>	<i>June, 1910</i>



PREFACE

TO
THE FOURTH EDITION

IN the present Edition the Lectures on Massage and Early Movements in Fractures have been revised. Two Lectures dealing with Sprains and their consequences and Rigidity of the Spine replace that on Derangements of the Knee-joint which has been omitted. The illustrations have been increased in number.

CHESTERFIELD STREET, MAYFAIR, W :
April, 1909.

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MASSAGE AND MOVEMENTS IN FRACTURES

INTRODUCTION

THE use of massage and early movements in recent fractures, originally introduced by Lucas Championière, was first adopted and advocated in this country by the present writer. In spite of the coolness and, in some quarters, the scepticism with which the treatment was at first received, there is no doubt that the method has been steadily growing in favour, and that it is now used either in its entirety or with some modification by all rational surgeons. The writer when first advocating the method was frequently regarded as an enthusiast—an entire misapprehension. The sole object of his support of the treatment was to obtain for it a fair trial with a view to bringing about a more reasonable attitude in the management of fractures than had previously been adopted by surgeons generally. The method was never advocated to the exclusion of the use of splints or of operations in the treatment of recent fractures,

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but it was strongly urged that a fair consideration should be afforded to a plan of treatment which, if used discreetly as an adjunct to the ordinary methods, modified as circumstances may demand, was believed to be sound in theory and advantageous in practice. This belief has, it can hardly be denied, been justified by subsequent experience. The method consists merely of the application of common-sense principles in the treatment of these injuries. Indeed, it cannot but excite surprise in the mind of any intelligent person that the stiffness, pain, and other disadvantages which so constantly follow the treatment of fractures upon classical lines should have been countenanced for so many years when they can, in the majority of cases, be entirely obviated by a treatment so simple as that described in the following lectures.

MASSAGE.

The advantages derivable from shampooing and manipulations in sprains, wrenches, and similar injuries have been recognised for centuries, especially as shown in the rapid removal of extravasated blood, the cure of oedema, the prevention of stiffness, and the checking of muscle waste—the identical complications which are prone to occur in fractures: a fracture being nothing more than an exaggerated form of sprain, the bone, in addition to the soft parts, having

been torn. It is presumed that no intelligent surgeon who has had any practical experience would in these days hesitate to use massage and movements in a case of sprain or wrench, however severe, if the bone were intact and the skin sound. The sole reason for avoiding the application of these common-sense methods in fractures seems to be the general belief that any plan of treatment which would entail movement, however slight, between the fragments, must be inimical to union and therefore unsound, if not actually dangerous, in practice. It is, however, quite certain that the very slight amount of movement entailed by this method, if properly applied, not only has no tendency to prevent union, but, on the contrary, may sometimes tend to promote union by the increase of callus so produced. It would be easy to give instances in support of this contention. The perfect manner in which union occurs in fracture of the ribs, or the excellent union which often follows upon fractures in the lower animals, notably the dog, in which immobility is generally quite out of the question, may be taken as examples ; on the other hand, the remarkable frequency of non-union in fractures of the skull, specimens of which may be found in every museum, in which of necessity there has been absolute immobility, should be noted. It must not be inferred from what has just been said that the writer advocates intentional movement of the

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fragments in recent fracture ; these remarks are simply intended to emphasise the fact that the amount of movement, if any, which occurs in the proper application of this treatment is not sufficient to interfere in any way with union, and need not, therefore, stand in the way of the application of the common-sense principles which apply, as a matter of course, in ordinary sprains.

In any case of recent simple fracture, unless the local condition of the skin from blistering or other causes is contra-indicative, massage cannot be commenced too soon with a view to the relief of pain and the prevention of spasm. The soothing effect upon irritable muscles in the majority of cases is most remarkable, in some instances rendering an apparently unmanageable fracture quite amenable to ordinary methods of reduction, which could not otherwise be effected without operation—a result the value of which in some subjects can hardly be over-estimated. The ease with which a difficult fracture can be manipulated after it has been subjected to gentle, smooth rubbing is often a revelation to those who have had no experience in the matter.

Massage is, moreover, a useful precursor of truly effectual voluntary movement, and it is an integral factor in the production of the fullest benefit derivable from passive movement, since the latter, although it prevents adhesions, does not prevent

muscle waste to any great degree, a defect which is supplied by massage.

EARLY PASSIVE MOVEMENT.

The object of early passive movement in recent fractures is the very simple one of preventing adhesions, as opposed to the results of the older methods of absolute fixation of the limb, which of necessity leads to some matting together of the parts about the fracture, which, after union has taken place, frequently requires for its cure either prolonged passive movements or forcible breaking down under an anæsthetic ; in any event, whatever treatment is adopted for the rectification of the stiffness due to adhesions resulting from long-continued fixation, the disability of the patient is prolonged beyond all reasonable limits and in some cases becomes permanent. There is no doubt that in the many cases of fracture in which permanent disability follows upon faulty position of the fragments, the major part, and sometimes, indeed, all, of the disability is dependent upon adhesions of the parts around the fracture and not upon the bony deformity, unless this is great or of the rotatory kind. In any case of fracture after the fragments have been placed in accurate position passive movements should be commenced at once. In a fracture of the leg, for example, gentle movements of the toes may be made immediately with a view to

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making some to-and-fro motion of the muscles about the fracture (this is the so-called 'internal massage') ; in fact, from the very beginning of a case treated on the lines under consideration the great object is to keep the muscles around the fracture continually on the move, which can be accomplished without any harmful movement of the bone fragments. Not only are adhesions thus prevented, but the circulation of the limb is stimulated and rapid union promoted. The earliest movements can be effected without the removal of splints, but in every case, as soon as the state of the fracture permits (*i.e.* from the third or fourth day onward), the splints should be loosened for gentle massage, by which the passive movement is not only rendered more easy, but also more effectual.

The main points in making passive movement in fractures which should be borne especially in mind are the following : (1) Steady fixation of the fracture itself should be insured, either by the grasp of the hand or by appropriate splints or apparatus. (2) All movements must be gently but deliberately made ; the grasp of the parts by the manipulator's hand must be firm and unhesitating, although gentle—in this way a sense of certainty and confidence is imparted which generally removes any inclination to resistance on the part of the muscles.

If, however, as sometimes happens, there should arise between the hand of the manipulator and the

muscles of the patient some involuntary antagonism (nearly always due to faulty handling of the parts), it can as a rule be obviated by practising the movements first on the sound limb, in order to give the muscles on the damaged side some idea of what is expected of them. The useful effect of this simple manœuvre is well demonstrated in cases in which a normal joint has been kept still for some time in splints—*e.g.* the knee-joint in a case of fracture of the upper end of the leg treated by plaster of Paris. Upon the removal of the splint, if the patient be told to bend the joint he will generally at first be unable to do so, but in such cases, unless adhesions are present, if the attempts at movement are repeated after the movement has first been made on the sound side, normal action soon commences on the defective side, and is, as a rule, rapidly regained voluntarily.

VOLUNTARY MOVEMENT.

Voluntary movement by the patient is in itself better than passive movement, because it not only prevents matting, but is also a potent means of preventing muscle waste, which is not greatly affected by passive movement, except when used in conjunction with methodical massage. Voluntary movement to any great extent cannot, however, be employed with safety until the fracture has become to some

degree consolidated, in consequence of the strain thrown upon the fractured part ; hence in the immediate and early use of movements these should be of the passive kind. The most useful movement of all is the combined passive and voluntary motion, gentle voluntary movements by the patient being aided by passive movement given by the manipulator at the same time.

The main objection to the use of voluntary movement is its liability to cause harmful movements between the ends of the fragments. This, however, is not so important a matter as at first sight may appear, excepting when the fracture involves the shaft of a long bone, and even in such circumstances careful support of the fracture area by the hand of the surgeon, or by means of a well-moulded splint during the voluntary movements of the parts below the break, is generally sufficient to prevent any harmful result. In fractures in immediate proximity to joints, and especially in intra-capsular fracture of the neck of the thigh-bone, voluntary movements are, in my experience, always beneficial, unless by chance the pain resulting from them is too acute to allow of their adoption—an exceptional occurrence.

POSTURE.

For the completely efficient employment of massage and early movements, the proper position of the

affected limb is a matter of much moment. In discussing the treatment of fractures from any point of view, it would at first sight seem superfluous to insist upon a cardinal point like the importance of posture. At the same time, it must be allowed that, obvious as the indications in this direction would naturally seem to be, it is not so commonly followed by practitioners as would be expected. It is, indeed, in the writer's experience not unusual to find this point entirely overlooked, and there is little doubt that many of the unsatisfactory results which are met with after fractures are due to the neglect of this rational indication.

Pott's fracture may be taken for an example. How often are cases seen in which the injury is treated in the extended portion of the limb with all sorts of contrivances for the prevention of the not unusual deformity caused by the falling back of the foot with resulting elongation of the heel, a characteristic displacement in this injury, although it is not mentioned by Pott in his original description of the fracture ; the obviously proper posture being semiflexion either in the manner described by Pott or by the use of that excellent apparatus, Neville's splint, or some similar contrivance. Again, how common it is to see ingenious but useless devices used for retaining in accurate position the fragments in a fracture above the knee, the limb being either nearly straight or at the most slightly flexed upon a double inclined

plane ; the ideal method being to place the limb in the flexed position, when the fragments almost naturally fall into good position. In all cases treated upon the lines of massage and early movements, care should be taken that the position of the limb is one in which the muscles which are likely to drag upon the fragments are in a state of the greatest rest—*i.e.* speaking generally, the position which is most comfortable to the patient. Further, in fractures of the upper end of the femur and of the humerus the indication is to bring the distal fragment in a line with the proximal one, and not by futile plans to endeavour to bring the proximal fragment into a straight line with the distal one.

Again, in making extension in such cases the fixed point should, when possible, be the knee or elbow, the trunk forming the extending weight.

CONCLUSIONS.

A prolonged experience of the use of the combined methods of massage, early movements, and rational posture in the treatment of ordinary fractures coming under notice almost daily in hospital work, confirms the writer in the favourable estimate formed by him as reported in his first communication upon the subject in the 'Lancet' of 1897, and leads to the following conclusions :

1. When managed with ordinary discretion and

with average dexterity the result of the method is undoubtedly advantageous, inasmuch as the time elapsing before the patient is able to resume his ordinary vocation is diminished by at least one-third, partly by the increased rapidity of union which ensues and to a great extent by the avoidance of the waste of time which occurs in correcting the stiffness and pain which so often follow upon the discontinuance of splints, in the majority of cases treated by means of the classical method of prolonged splinting &c.

2. The advantages resulting from early passive and voluntary movements—an essential precursor of which is massage—are especially noteworthy, a fact which was fully elicited in an inquiry made by the present writer in connection with a communication¹ read at the meeting of the British Medical Association at Ipswich in 1900, the evidence obtained proving conclusively that early movement is followed by a corresponding early return to the ordinary vocation of the patient.

3. The benefit of the method is remarkably demonstrated in fractures in which the chances of union without operation are practically *nil*—e.g. intra-capsular fracture of the neck of the thigh-bone—the indications being to obtain the best use in the damaged limb by insuring free movement and by preventing the wasting of the muscles concerned ; in such cases massage and movements are indicated at once.

¹ 'The Present Practice in the Treatment of Simple Fractures.'

4. The danger of thrombosis and embolism feared by some surgeons does not exist more than in fractures treated by prolonged splinting. Cases of embolism may have occurred in the course of treatment upon the lines under consideration, but the writer, whose experience of the method is probably larger than that of any other surgeon in this country, has met with no such case, although he has seen five instances of embolism (two fatal) in cases of fractures managed by prolonged splinting. Thrombosis and embolism will from time to time occur in fractures however treated, a fact of which any surgeon of large experience must be painfully aware.

5. The method is not suited to those who lack discretion or who are defective in dexterity—a remark which applies with equal force to the majority of surgical methods ; to such the classical treatment by prolonged splinting, whatever its disadvantages may be, is better adapted.

6. The principal disabilities attaching to the union of fractures in faulty positions, unless the displacement be gross or of the rotatory kind, are avoidable by the use of massage and early movements, by which adhesions around the fracture are avoided.

7. The method is not to be regarded as a substitute for treatment by splints on the one hand or by operative measures on the other, but should be used as a rational adjunct to each.

LECTURE I

THE USE OF MASSAGE AND EARLY MOVEMENTS IN RECENT FRACTURES AND OTHER COMMON INJURIES.

AT the beginning of February 1898 I called attention in the 'Lancet' to the use of massage in recent fractures, a treatment which had previously received too little notice in this country. After having had some experience of it I then came to the conclusion that, rationally practised, this treatment was probably the best method which could be used in the majority of ordinary fractures, both simple and compound, when the circumstances of the practitioner and of the patient permitted its adoption. The result of that communication was a considerable increase in the use of the method. It has been employed freely in St. George's Hospital with excellent results. Latterly, however, there has been some falling off in its use—not because there is anything wrong in the principle of the method or with its results, but because it is at times difficult to keep the necessary number of dressers, who of course are constantly changing, sufficiently instructed in the details to enable it to be

safely carried out. I have, therefore, thought that it might be useful to devote some time to a practical description of the way in which the treatment should be applied.

I do not propose to confine my remarks altogether in these lectures to massage in fracture, as I think it will be useful to deal generally also with the legitimate use of rational massage in common surgical injuries. In other words, I shall try to say something useful about the treatment of recent fractures, of dislocations, and of sprains and bruises by the same means. It is possible that I may be able to say something useful about the treatment of each of these varieties of injury ; at all events, I hope the time spent in considering the matter will not be entirely wasted.

THE USE OF MASSAGE AND EARLY MOVEMENT IN RECENT FRACTURES.

It is well known that the real difficulties and disappointments in cases of fracture, when they are treated in the ordinary way, often commence after the union has taken place and the patient begins to think of getting about. There are, of course, initial difficulties in connection with the 'setting' of the bones and in the subsequent keeping of the fragments properly in place ; but these, as a rule, cause no great

trouble provided they are intelligently met. The difficulties in the later stages are mainly pain and stiffness, which frequently require a long and trying course of massage and passive movement to enable the patient to get about with comfort or to follow his occupation, and which sometimes lead to permanent crippling. In the case, for example, of a fracture of the leg treated in the ordinary way by having been placed in splints or in plaster of Paris, or in some other contrivance of that kind, for a long period, say from six to eight weeks, it will be found that when the splint, of whatever kind it may be, is taken off and the patient begins to walk about or tries to walk about, complaint is frequently made of intolerable pain about the ankle and sometimes across the sole of the foot. The ankle is stiff, the knee may also be stiff, and the muscles are wasted, so that the leg may be little more than bone and skin. Supposing, however, that the case has been treated rationally by massage and movements from the beginning, it will be found that the patient is afflicted with none of these troubles ; the ankle is not stiff, there is no pain such as I have mentioned, and the muscles are not wasted, because when massage and early movements are used they are prevented from shrinking ; in fact, when the patient begins to get about the ankle is free and supple, and the muscles are almost in the same condition as those of the

sound limb. These are obvious and great advantages. The reasons of the discomfort which patients suffer when the treatment has been conducted upon classical lines are easily explained. The stiffness is due to the fact that in consequence of the limb having been placed in an immovable splint for a long period the joint included in the splints becomes, as a matter of course, temporarily stiff. If, for example, a perfectly healthy ankle-joint were put into a plaster-of-Paris splint for several months it would be found upon the removal of the splint that the natural mobility of the joint could only be obtained at the expense of some pain and discomfort. In fracture the stiffness is of course infinitely increased by the adhesions of the soft part around the seat of the lesion.

A noteworthy pain in fracture of the leg is that which shoots downwards from the seat of the fracture along the back of the leg, behind the inner malleolus, and thence into the sole of the foot. This pain is sometimes most acute, and at times leads to permanent crippling: it is due to neuritis produced by the parts about the fracture becoming matted at the level of the injury; this matting sometimes involves the posterior tibial nerve, and so gives rise to the neuritis. This condition is no imaginary one, since I have proved it by dissection.¹ The result of this condition is that when the patient begins to

¹ The *Lancet*, February 5, 1898, p. 359.

try to use the limb after the mere stiffness due to the splints has been overcome, any free movement of the foot causes a dragging upon the adherent nerve, so that an intense neuralgic pain is caused. So acute is this pain in some cases that it prevents the patient proceeding further with attempts to get better movement. People are therefore sometimes seen walking with stiff ankles after fractures of the leg which have been treated by persistent splinting, not because the stiffness cannot be overcome, but because the pain on movement of the ankle is so great that they are unable to bear the necessary manipulation. All this trouble is preventable by the use of intelligent massage and movements in the early stages of the treatment.

In the early stages of fracture the main difficulty is, as I have already said, connected with the setting of the bones, the difficulties arising in this respect being mainly three. One is the ordinary nervousness of the patient, which, of course, can only be overcome by tactful management or by the administration of an anæsthetic ; the second is connected with the direction or other peculiarity of the fracture ; and the third difficulty arises from muscular spasm, the result, no doubt, either of irritation of the muscles by sharp edges of bone or of direct laceration of the muscles themselves, which in consequence become hypersensitive and excitable. I know of nothing more difficult to relieve under ordinary

circumstances than the muscular spasm which comes on after the injury in some cases of fracture. Not only is it painful to the patient, but the constant muscular contractions frequently render the retention of the fragments in proper position almost impossible.

In the old times—and with some people it is even

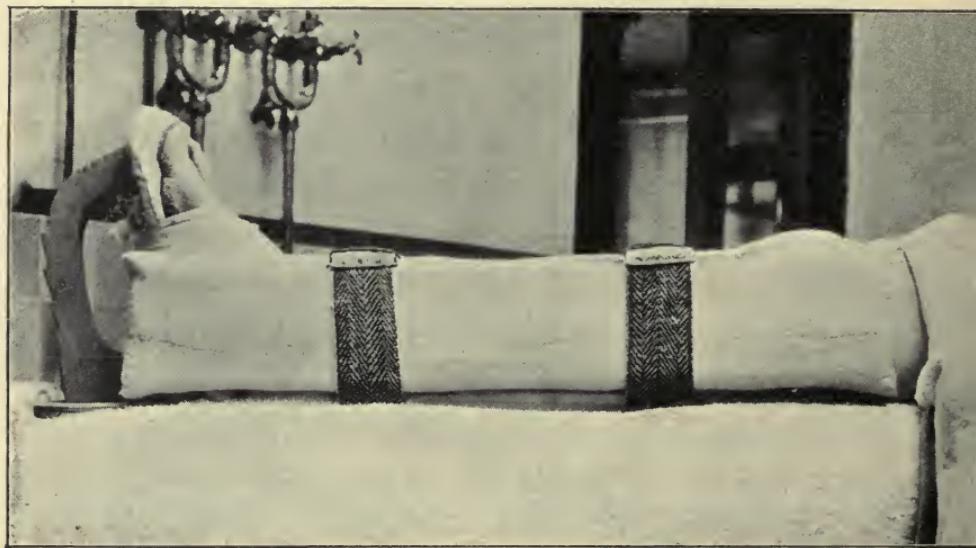


FIG. 1.—MASSAGE IN RECENT FRACTURE OF THE LEG

STAGE 1: *The Fracture set.*—The limb is secured on a back-splint, with a slightly oblique foot-piece, by bandages at the ankle and knee. Side-splints fixed by webbings or straps complete the fixation of the fracture.

the custom now—it was sought to overcome this spasm by tenotomy; and since spasm is more commonly met with in the muscles of the calf than elsewhere, division of the tendo Achillis was the operation most frequently performed with this object, because it was thought that division of the tendon would for the time being paralyse the gastrocnemius and soleus,

and would permit of the proper adjustment and retention in position of the fragments which could not be otherwise accomplished. It is not unusual after the reduction of a fracture with or without the aid of an anæsthetic—we will, for an example, take the case of the leg—to find when the patient recovers consciousness that uncontrollable spasm occurs ; the pain is acute, muscular contraction is inevitable, and if the fracture is at all oblique the displacement recurs. Spasm of this kind is more efficiently controlled by massage than by any other plan, excepting perhaps by prolonged general anæsthesia or by narcotism by opium, alternatives which are obviously undesirable in ordinary circumstances.

Assuming that massage in these cases of recent fracture is right—as I have no doubt it is—the next point for our consideration is the method of its application. There are, roughly, three stages in the process, and each of these stages effects certain purposes. Naturally, the first thing in every fracture is to 'set' the broken bones, by which I mean placing them in their proper positions. Nothing short of accurate replacement of the fragments in their proper position should be regarded as a satisfactory 'setting.' *The primary point, therefore, to be borne in mind in every case of fracture is that too much trouble cannot be taken in the first instance in getting the bones into position.* With regard to the

plan of fixing fractured bones in position by the use of screws, nails, pegs, wire, &c., I propose to say nothing here. The method is under certain conditions a good one, but it obviously cannot be freely



FIG. 2.—MASSAGE IN RECENT FRACTURE OF THE LEG

STAGE 2: Immediate Smooth Rubbing.—Commence at any time, the sooner the better, after the fracture has been 'set.' The straps fixing the side-splints are unfastened and the splints are allowed to fall away from the limb. The knee is then steadied by one hand of the manipulator, whilst smooth gentle rubbing from the foot upwards is effected by the other hand, which is made to grasp as much of the circumference of the limb as possible. The time required is from five to ten minutes. The objects are the relief of muscular spasm and rapid absorption of effused blood &c. At the end of this stage the side-splints are replaced, leaving the parts in the condition shown in fig. 1.

adopted by the ordinary practitioner, although it may produce excellent results in the practice of some of us.

Returning from this digression to the method of applying massage, let us suppose that this man before you has a broken leg, somewhere below its middle.

¹ See *Present Position of the Treatment of Simple Fractures of the Limbs*.

He has come at once to the hospital, and the fracture has been what is commonly called 'set'; and as he has come to a great hospital we will suppose it has been properly set. There is a good deal of swelling about the fracture; there is also a certain amount of muscular spasm. He complains so much of the spasm that unless something is done he can hardly lie quiet, and he certainly cannot sleep or feel comfortable. The ordinary method under such circumstances is to give an hypodermic injection of morphia, or, if the bones are not in precise apposition, to give an anæsthetic if that has not already been done. You will, however, find that unless the bones are out of place—in which case you must at once rectify the defect, under the guidance of the *x*-rays if these are available—gentle rubbing over the fracture, merely a smooth upward movement of the hand which grasps as much of the circumference of the limb as possible, will in a very few minutes, in the majority of cases, practically relieve all spasm. You will sometimes find people who are suffering from spasm to such an extent that they cry out with the pain, and who are certainly unable to get any peaceful rest, after a few smooth passages of the hand over the damaged part settle down comfortably; in some cases they will actually fall asleep whilst the rubbing is proceeding. This manipulation, however, must be done in the right way—that is to say, with the flat of the palm of the hand

grasping the limb very smoothly and uniformly in the way I show you (*vide* fig. 2). You need not be in the least degree afraid of passing the hand over the fracture if it is done properly. Patients do not resent the pressure at all—in fact, they rather like it, as



FIG. 3.—MASSAGE IN RECENT FRACTURE OF THE LEG

STAGE 3: Commencement of Internal Massage.—After preliminary smooth massage, as described in Stage 2, one hand of the manipulator is insinuated between the toes of the affected side and the footpiece of the splint (fig. 3). Dorsal flexion is then effected as much as possible by rotating the hand forwards and downwards (*vide* fig. 4). This movement is repeated from five to ten times, the fracture being steadied by the grasp of the other hand of the manipulator. The date of the commencement of this stage may be any time after the second day. The objects are, early slight movement of the flexor tendons at the back of the ankle to prevent adhesions. Movement of the toes separately instead of *en bloc* may be substituted at discretion. At the end of this stage the side-splints are replaced as in fig. 1.

some of you know already from what you have seen in my practice. The first object, then, that massage effects in these cases is the relief of the pain due to spasm should it be present. The same smooth move-

ment that I am now applying very gently over the swollen parts immediately about the fracture will also bring about absorption of the effused blood with extreme rapidity, so long as the rubbing is smoothly and carefully carried out. The splints used for the treatment of the fracture, you will note, consist of a back-splint with an oblique foot-piece and two straight



FIG. 4.—MASSAGE IN RECENT FRACTURE OF THE LEG
(See fig. 3)

side-splints, the latter being secured by straps so that they are easily loosened (*vide* fig. 1).

Immediate muscular spasm having been allayed in the manner indicated, the side-splints at the end of two or three days are loosened and the limb is left exposed on the back-splint as this man's is

(*vide* fig. 2), and every day the massage is employed, at first mainly to get rid of the effused blood round about the fracture. At the end of the third day, again, after practising this smooth massage for ten minutes, passive movement of the muscles and tendons at the back of the ankle and in the calf should commence. In order to effect this you begin very gently by moving the toes only. The foot is still bandaged and the splint remains in the way you see here. The hand is insinuated under the toes in the way I am doing (*vide* fig. 3) and dorsal flexion of the toes *en bloc* is made (*vide* fig. 4). Every time the toes are bent in that way the flexor tendons are pulled upon, and so a little movement is produced. The movement thus produced in the calf accomplishes the beginning of what is called 'internal massage,' by which I mean that there is a little rubbing movement up and down of the deep muscles in the calf of the leg. This proceeding not only stimulates the circulation, but it makes sufficient movement to prevent immediate adhesions from forming about the fracture, which would otherwise occur. The first passive movement then concerns the toes: this is begun on the third day and continued for two days—say, until the fifth day. If all goes well passive movement of the ankle may be commenced from the fifth to the seventh day. For this purpose the limb is allowed to lie quite com-

fortably, as it will do now, on the back-splint, the side-splints having been removed and the bandage around the ankle taken off, the bandage above the knee remaining undisturbed (*vide* fig. 5). The foot



FIG. 5.—MASSAGE IN RECENT FRACTURE OF THE LEG

STAGE 4: Increase of Internal Massage.—After the usual preliminary smooth massage the bandage fixing the ankle is removed, leaving the limb secured above by the bandage at the knee, and at the seat of fracture by the grasp of one hand of the manipulator. The other hand insinuated between the sole and the foot-piece of the splint firmly but gently grasps the foot and makes passive flexion at the ankle as freely as possible five or six times without moving the fractured bones. The date of commencement of this stage may be any time after the fourth day, but may in difficult cases have to be postponed as late as the eighth or even the tenth day. The object is movement of the ankle-joint and muscles at the back of the leg and the calf to prevent adhesions, especially at the posterior aspect of the fracture. At the end of this stage the splints are replaced as in fig. 1.

is now firmly grasped with one hand and freely moved at the ankle-joint, the fracture being at the same time steadied by the opposite hand. After a few days the patient may be allowed to make voluntary movements of the ankle as it lies on the splint,

the fracture being steadied by the surgeon's hand. Having arrived at this stage of the process all fear of adhesion about the ankle-joint or the parts behind the fracture ceases. It may happen in exceptional cases that the patient is so over-sensitive or the damage to the soft parts so extensive that the plan cannot be carried out with safety, but if employed with intelligence you will rarely find any case in which it cannot be profitably used. For the passive movements from three to five minutes at each sitting are sufficient. The passive movements are always preceded by a quarter of an hour's smooth rubbing, by which the patient is generally made most comfortable, and should be followed by voluntary movement, the region of the fracture being supported by the hand. These manipulations are repeated day by day, extending at the end of the first fortnight to as much as half an hour for each sitting. At the end of a fortnight—a little more or less, according to the state of union—attention should be given to the joint above the fractured point. The joint below the fracture is, however, naturally the most important, because it is that which is most interfered with if adhesions form. At the end, then, of a fortnight or less, after having done what is necessary for the leg, the knee may be profitably subjected to passive and voluntary movements. In bending the knee great care must be exercised, because the frac-

ture being only a fortnight old, or a little more, is not in a condition of anything like firm union. The bending of the knee may be carried out in one of two ways. It may be done (1) by simply taking the leg, as you have often seen me do, with one hand under the limb just above the heel and the other grasping it under the thigh in the way shown in fig. 6, and then lifting the knee from the splint. By degrees, as the case goes on, the knee may be raised more and more until at the end of three weeks it is bent up to a right angle. During the whole of these manipulations it must be constantly borne in mind that a recently broken limb is being dealt with. Although that is the plan I adopt in managing these fractures myself in private work or when my masseur or masseuse is managing them for me, it is safer for hospital purposes at this stage, after the massage for the foot and leg has been finished, (2) to put on a pair of short side-splints, retained in position with straps or webbings, and then to bend the knee and ankle in the way I show you (*vide* fig. 6). This brings the treatment up to about the end of the third week after the receipt of the injury, and by this time in the majority of cases treated on this plan the fracture is nearly sound—not sound enough for walking, but sound enough for the patient to be left without any splint. The patient can lie in bed if so disposed, or if he prefers to be getting up and sitting on a couch or chair he may do so after

having been provided with a case of poroplastic felt or leather to be worn around the calf over the seat of fracture, as a protection. At the end of three weeks you will find that complete ordinary muscle massage may be thoroughly carried out in order to develop the muscles throughout the limb.

Such is the way in which massage and early movements may be used in any ordinary case of fracture of the leg. The nearer the fracture is to a joint the more important it is that this method should be carried out, for the simple reason that the nearer the fracture is to a joint the more likely is it that there will be subsequent pain and stiffness.

Please understand that the use of massage and passive movement in these cases in no respect lessens the necessity for the point of primary importance in all fractures—i.e. placing the fragments at the outset in accurate position.

Pott's fracture is always a difficult fracture, as is well known, not only on account of the difficulty which often arises in the 'setting' of it, but because of the matting of parts which is liable to take place afterwards. Once the bones are in good position in this fracture you need have no hesitation in beginning passive movement in two or three days after the injury at the latest, and smooth massage may be commenced directly after the accident with great advantage. Because Pott's fracture happens to so

nearly involve the ankle-joint there is no reason why passive movement should not be used immediately; on the contrary, this is a strong reason for its adoption, for it is only by its use that the avoidance of adhesion and stiffness can be with certainty accom-



FIG. 6.—MASSAGE IN RECENT FRACTURE OF THE LEG

STAGE 5: Increase of Passive Movement and commencement of Complete Massage.—The back-splint is now dispensed with, the fracture being fixed by means of side-splints straight or with foot-piece (Cline's). These having been removed, the limb is laid on the bed or couch, and complete ordinary massage is applied for fifteen minutes. Unless the union is very firm, the fracture is then fixed by two short splints, or, better, by a poroplastic or leather splint. Passive movements of the ankle and knee are then made in the manner shown in the figure. The flexion at the knee not only prevents stiffness of that joint, but allows more free internal massage by relaxing the calf muscles. The date of commencement may be at any time after the fourteenth day, according to the state of the union.

plished (*vide* fig. 7). I have described the case of a fracture of the leg because it is one of the most easy of fractures to manage by this method. When fractures are treated on the lines I have described it will be found, if the practitioner will devote the necessary

time, and when the sufferer has the patience, that a better result will follow than can be effected by any other plan without operation, and that ultimately the time which is occupied in the complete recovery of the patient is little more than half of that which follows the treatment by splints in the ordinary manner.

There is one injury in which the effect of the use of this plan from the beginning is most remarkable—viz. intracapsular fracture of the neck of the thigh-bone. So far as massage of the part is concerned in a fracture of that kind it cannot be commenced too early. If it is started a few minutes after the injury it is not too soon. In such cases, as you well know, the pain is sometimes very acute, and the spasm is often almost continuous, the patient complaining bitterly of the jumping of the limb and the intense discomfort caused by the spasm. The suffering resulting from the spasm can be removed very rapidly by smooth rubbing of the sort I have described. In such a fracture it is unnecessary to trouble too much about adjustment of the fragments. Excepting cases of impaction, or occasionally when the operation of screwing the fragments together has been immediately adopted, bony union, as you know, rarely occurs, and the indication therefore is to obtain as useful a limb as possible, although there may be no bony union of the fracture. The object in view should be to get a

Skiagram showing the condition of an ordinary fracture of the tibia and fibula five weeks after the injury, in a case treated by the method of massage and early movements.



movable and painless limb with the muscles as strong as possible. No splints should be used. Splints in such cases tend to the production of bed-sores and promote the wasting of muscles. They do no good, and they render the patient most uncomfortable. Therefore let these cases be treated by



FIG. 7.—MASSAGE IN RECENT FRACTURE OF THE LEG

Showing the amount of voluntary movement at the ankle in a severe case of Pott's fracture two weeks and three days after the injury. When the patient was admitted, immediately after the accident, the foot was displaced completely outward, the transverse horizontal plane of the sole being vertical. The use of all splints was discontinued in the third week.

smooth rubbing at once and passive movement in 24 hours. A masseuse, or any intelligent person with a moderately soft touch, can give more comfort in a case of this kind than all the narcotics and anæsthetics in the pharmacopœia. In a day or two let passive movement be commenced. Have no anxiety about

the union, your main objects being to give comfort and prevent muscle-waste: upon the prevention of muscle-waste the ultimate utility of the limb will for the most part depend. The worst thing that can happen in cases of this kind is wasting of the muscles, which can be obviated by intelligent massage and movements. This, then, is the treatment under ordinary circumstances which I strongly commend to your notice in such cases. The use of a splint should be altogether avoided, smooth massage should be commenced at once, passive movement should follow quickly, flexion and extension should be effected by lifting the knee from the bed in the way I show you (fig. 6), and rotation movements should be the last to be practised. For the first three or four days let passive flexion and extension be made as often as possible; no pain occurs if the limb has been previously rubbed smoothly and gently. In a week or two rotation may be used. At the end of a week voluntary movements should be encouraged as much as possible. Under no circumstances should any passive movement whatever be employed until the neighbourhood of the injury has been subjected to a good smooth rubbing. You may use liniments or not, as you please, but it is the rubbing which does the good.

There are few fractures in the whole body which were formerly followed so frequently, I suppose, by a certain amount of defective movement as Colles's

fracture, the result almost entirely of the matting of the parts. Sometimes it is said that the defects which follow in Colles's fracture are entirely due to the alteration in the relations of the bones produced by the injury. In certain of the cases the bones remain without doubt altered in their relations to one another, but the cause of the want of movement does not, as a rule, lie with the altered bone relations. The cause of the want of proper movement is nearly always adhesions and nothing more, and if these cases are treated intelligently by massage and movements from the first there is little fear of defective results. The method I use in such cases is as follows : The fracture having been 'set,' the forearm is placed upon one of the many kinds of splints which have been devised for this fracture—Carr's splints being, I think, on the whole the best ; but the kind of splint is immaterial so long as the anterior splint is placed well behind the bases of the fingers. Before the back-splint is applied gentle smooth rubbing should be used, the patient being immediately told to flex and extend the fingers as much as possible and as often as possible. The back-splint should from the first be removed daily for smooth rubbing. In two or three days a little gentle backward passive movement at the wrist should be made whilst the part lies exposed on the anterior splint after the smooth rubbing. In from four to six days after the injury the part should

be gently lifted off the splint after the usual smooth rubbing and held by the manipulator with one hand firmly grasping the fracture area whilst the other hand flexes and extends the wrist a few times in succession (fig. 8). This is repeated daily, the amount

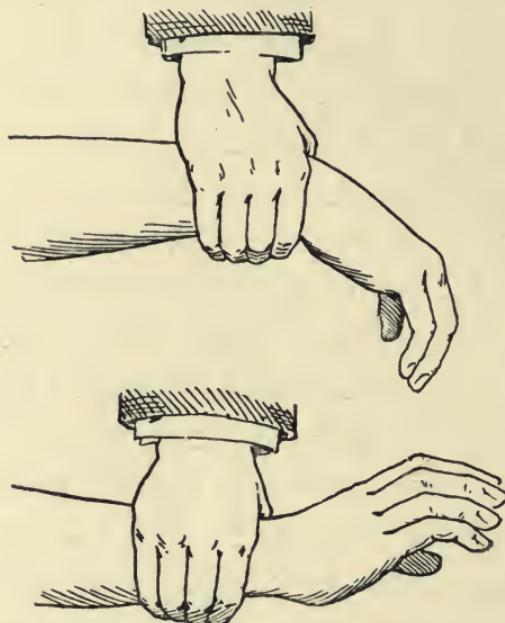


FIG. 8

A drawing by Mr. Mummery, F.R.C.S., showing the amount of voluntary movement, obtainable nine days after the injury in a case of Colles's fracture treated by this method. The manner in which the fracture is steadied by the grasp of the practitioner during its temporary removal from the splint should be noted.—From an article by the Author in the 'Practitioner,' August 1901.

of movement increasing gradually as time goes on. In a week the patient may be allowed to make the movements freely of his own accord after he has been provided with a poroplastic or leather splint which is easily removed and replaced. Ordinary

complete massage is at the same time commenced daily. At the end of three weeks all splints may be discarded, the arm being carried in a sling for another week only.

Again, let me impress upon you the fact that the most important practical point to be borne in mind in connection with the use of passive movement in cases of recent fracture and other injuries is this : *passive movement should always be preceded by smooth massage, which soothes the irritable muscles so completely that movements of the most complete kind are readily employed without exciting muscular contraction of a harmful sort.* If, on the other hand, passive movement is abruptly attempted without preparing the muscles by previous smooth rubbing violent muscular action generally occurs, which is not only painful to the patient, but tends to throw the fractured bones out of place. There is, I am sure, no dictum in surgery which is more sound than this :—In all cases in which passive movement is practised smooth muscle massage should precede the movement.

Another set of fractures which may be treated by this method with a result which, speaking generally, surpasses that of any other plan are those occurring in the immediate neighbourhood of the shoulder-joint. The difficulties under ordinary circumstances of dealing with such fractures are too well known to require comment. I am now referring to fractures

of the extreme upper end of the humerus and of the scapula close to, or involving, the shoulder-joint. It is a matter, I suppose, of common knowledge that such fractures are followed much more frequently than some people suppose by stiffness of the shoulder-joint. It is, in fact, not uncommon to find upon examining a patient at a long interval after a fracture of this sort that the shoulder-joint is quite fixed, although the patient may be ignorant of the fact. Many patients who have sustained an injury of the kind I am now discussing complain continually of acute pain in attempting to raise the arm beyond a right angle from the body. In the case of the majority of patients who complain in this way an examination will show that the scapula in the movement mentioned moves with the humerus, and that movement in the shoulder-joint is practically *nil*. In fact, a considerable proportion of people who have sustained this kind of injury, especially if the lesion has been treated by means of continuous splinting or fixed apparatus, never regain free movement in the joint.

The method which I use, because it has given me the best results, in all these fractures about the shoulder in the immediate vicinity of the joint, whether the lesion is of the humerus or of the scapula, commences with smooth rubbing in the ordinary way *at once*. From the beginning of the case I



A case of fracture of the humerus, showing faulty position of the fragments. The accident occurred at sea. The only treatment the patient received was at the hands of the ship's mate. The result is shown in Plate III.

Plate III.



Photographs showing range of movements attainable by the patient in the case shown in Plate II. thirteen months after the injury, the patient having been doing the duties of an ordinary seaman from a few weeks after the injury.

use passive movement very gently indeed. One hand is placed on the shoulder, gripping the part as a whole. This fixes the shoulder-girdle. To-and-fro movements of the arm are then gently made, especial care being taken to avoid rotation. If rotation is made movements between the fragments are liable to follow freely, and so union may be delayed or prevented. You need have no fear of harm coming from antero-posterior movement. At the end of three or four days gentle abduction from the side of the trunk is commenced ; at the end of a fortnight circumduction may be gently carried out, and voluntary movements used. Rotation should not be attempted for at least a fortnight, after which rotatory movements should be daily made. For these fractures near the joint I do not use splints, excepting a protective shoulder cap of leather or poroplastic felt retained in position by straps so that it can readily be removed for the daily massage ; nor do I use pads in the axilla. The arm is merely allowed to rest in a sling. By this method the treatment of cases of fracture close to the shoulder-joint may be completed in three weeks, and I have never seen such good results attained in so short a time by any other plan. If in such cases the parts are confined in splints for long periods a stiff shoulder-joint follows, as I have already said, much more commonly than is generally supposed—a statement

which can easily be verified by the examination of cases so treated at long periods (say nine months or one year) after the injuries.

The results obtainable by this method in fractures involving the elbow-joint are very remarkable. In such cases when the damage is great and the bones, as shown by the *x*-rays, greatly displaced, the adjustment and fixing the fragments by means of screws, pegs, or wire provide the ideal treatment, but this is not always practicable ; indeed, it is obvious that only a small minority of cases of this kind comes under the care of those who are in a position to use these operative measures.

Plate IV. represents a case of the kind which was under my care at the Seamen's Hospital, Greenwich, operation having been declined by the patient.

In six weeks from the date of the accident the movements of the part were nearly normal in extent and the muscles strong. It is doubtful whether as good a result could have been obtained even by operation in the most practised hands.

It would obviously be impossible within the limits of lectures like these to give the details of the treatment of every kind of fracture, but the examples I have described give a fair idea of the principles of the plan, which can readily be applied by any intelligent person. It is a method of treatment which



Photographs showing range of voluntary movement, 24 days after the accident, in a comminuted fracture of the humerus involving the elbow joint, treated without operation by early movements and massage. In six weeks, with the exception of a very slight limitation in flexion, the movements were as free as those on the opposite side.

must be conducted with discretion. In compound fracture it is not always practicable in the early stages, but after the wound has healed it can be used as if the case were one of simple fracture, and in the earliest stages of many compound fractures



FIG. 9.—MASSAGE AND EARLY MOVEMENT IN RECENT FRACTURES

Showing the amount of movement and the general condition of the left lower limb in a case of fracture through the condyles into the knee-joint six weeks after the injury. The limb is shown in complete extension and in flexion, the effect being produced in the photograph by taking the limb in the two positions upon the same plate (see also fig. 7). At the date upon which the photograph was taken the patient was up and walking about the ward freely with a hardly perceptible limp. The absence of wasting of the limb generally is noteworthy.

there is no reason why passive movement of the joint most likely to be concerned should not be practised at once, although the fact that the manipulations

cannot at first be preceded by smooth massage places the practitioner at some disadvantage in such cases. In young children, again, there may be difficulties in using the method in its entirety, but even in these cases it is quite curious how a frightened child with a fractured limb can be soothed by gentle massage of the part.

The great advantages of the treatment are : (1) the ease with which the patient is made comfortable by arresting the muscular spasm, and so relieving the pain ; (2) the effecting of rapid absorption of effused blood &c. ; (3) the prevention of stiffness by obviating the formation of adhesions ; (4) the prevention of muscle-wasting and the preservation throughout the case of the normal nutrition of the limb ; and (5) the shortening of the time by about half during which the patient is prevented from resuming the ordinary use of the limb.

The only real objections to the plan are, I think : (1) the difficulty which must often arise in carrying it out, as unless a competent masseur or masseuse is available the time required must frequently be more than the ordinary practitioner can spare ; and (2) the fact that the treatment is one requiring so much intelligence and discretion in the mode of its application that it may be difficult at all times to find a person to whom it may be entrusted with safety when the practitioner is not prepared to manage

the details himself. The objection which has been raised on the ground that harmful movements of the fractured bones must result is of no value if the treatment is properly carried out, as the movement is then practically *nil*, and certainly not enough to prevent union in any degree whatever. What the results of the treatment of recent fractures by massage in the hands of others has been I do not know, but so far as my experience is concerned the results are far superior in the majority of cases to those obtainable in any other way. I am not acquainted, for example, with any other treatment by which the results depicted in figs. 7 and 9 could be obtained in an extremely severe case of Pott's fracture, and in a case of fracture into the knee-joint. With increasing experience of the method my belief in it has steadily become more sure.



FIG. 10

Skogram showing the condition of the bones in a very difficult oblique fracture of the tibia and fibula six weeks after the accident, the immediate massage and early movement method having been used after operation had been negatived. During the first week much difficulty arose in maintaining anything like good position. The fracture of the fibula was almost at the same level as that of the tibia, but does not show in the skogram. The patient was walking naturally at the end of six weeks with a limb perfect in its 'mechanics.'—From an article by the Author in the 'Practitioner,' August 1901.

LECTURE II

THE USE OF MASSAGE AND EARLY MOVEMENTS IN
RECENT FRACTURES AND OTHER COMMON INJURIES
(*continued*)

IN my previous lecture the expiration of the time at my disposal compelled me to omit any mention of two varieties of fractures of considerable importance from the point of view of the treatment by the use of immediate massage—viz. fracture of the patella and of the olecranon. Until recently, as you know, the classical method of treating these fractures was by long confinement in splints or fixed apparatus (the period in the case of fracture of the patella extending sometimes to as much as a year or even more), with the object of obtaining as firm a union between the fragments as possible. Under such circumstances it cannot be considered remarkable that in many cases the difficulty in obtaining free movement in the knee-joint at the end of the splinting period was extreme, and that in some cases, indeed, the pain and distress entailed in the necessary treatment were more than the patients could endure. So great, indeed, was

the pain sometimes under these circumstances that a certain number of people who had sustained a fracture of the knee-cap, rather than bear the pain entailed in getting free movement, preferred to remain with the limb more or less stiff. Speaking generally, the stiffness that follows upon a fracture of the patella, treated upon the old lines, depends largely on the fixation of the upper fragment to the anterior aspect of the femur at the time when attempts at movement are commenced—not, of course, by bony ankylosis, but by adhesions which, forming around the margin of the knee-cap, so tighten the soft parts about it that it is for practical purposes sealed to the surface of the femur. In attempting to get movements in these cases when treated, as I have said, in the olden way, no really good result could be obtained until these adhesions, as well as those in the joint, were loosened—a difficult and painful process which was rendered necessary merely because the parts had been confined so long in splints without movement. Moreover, the strain put upon the parts under these circumstances frequently led to a great stretching and sometimes laceration of the uniting medium. The upper fragment of the patella remained, in fact, at first fixed, and before the exercises had resulted in the breaking down of the adhesions, movement was often obtained at the expense of the stretching of the union, the

stretching in some cases being very great ; but even in such cases, so long as the upper fragment ultimately became freely movable upon the femur, a fairly good limb resulted in the majority. In the absence of the treatment by suture now so commonly employed the final result is dependent mainly upon two points : (1) the amount of laceration of the lateral expansions about the knee at the time of the injury (the less the lateral expansions are ruptured the more strength is there left in the joint after the fracture);¹ and (2) the amount of mobility finally retained by the upper fragment of the patella. If the fragment does not contract inveterate adhesions, and finally becomes freely movable upon the femur, a more or less useful limb follows, the strength of the limb, *as a rule*, then being in inverse ratio to the length of the uniting medium. If, on the other hand, fixation of this upper fragment occurs, then the interference with the mobility and strength of the joint is so great that the patient is much crippled.

The first object, then, in a case of a fracture of the patella, whether wiring has been practised or not, is to prevent by constant manipulation any chance of adhesions forming around the upper fragment and fixing it to the femur—a treatment which excludes any form of splint which makes the patella inaccessible. This necessity for securing free mobility of the patella

¹ See *Present Position of the Treatment of Simple Fractures*.

is not confined to cases of fracture, but if a rapid and perfect result is to be obtained it should be used in all cases of inflammation of the knee-joint, traumatic or otherwise, liable to be followed by stiffness. This is a point to which reference will again be made.

As I have already said, this method of treatment makes the use of fixed immovable apparatus impossible, such, for example, as plaster of Paris, silicate of potash and the like. I may at once state that I have no doubt that the sooner these stiff, immovable appliances become obsolete the better it will be in all cases of damage of joints and in the neighbourhood of joints. The stiffness and pain which so often followed in fracture of the patella when treated upon the old lines were much more frequently due to the treatment than to the injury. The best results which follow fracture of the patella when not subjected to the wiring treatment will be obtained by immediate smooth massage and patellar manipulation, followed in a fortnight or earlier by gentle passive movement of the knee, during which *the upper fragment should be firmly fixed by the hand of the manipulator in order to prevent its being drawn up towards the thigh.* By this means, if effectually managed, flexion to a right angle can generally be accomplished without increasing the separation. In this way, in the majority of instances, a useful limb may be expected in from three to six months,

all splints being discarded at the end of the first month. It is remarkable how little, if any, stretching of the union occurs in cases treated in this manner *when care is taken from the outset to secure free movement of the patella upon the femur.*

The same observations apply with equal weight in the case of fracture of the olecranon. It will be found upon examination that in the majority of cases of fracture of the olecranon treated by long-continued immobility in splints the detached fragment of the olecranon is fixed to the humerus. I do not mean that it is always fixed by bony ankylosis, but it is connected to the humerus by such strong adhesions that it is very difficult to move it at all. Further, it will be found that the utility of the limb in such cases is in direct proportion to the mobility of the detached fragment upon the humerus—in fact, the utility of the limb depends more upon this factor than upon the apparent strength of the union. When the fragment is fixed it will be found upon commencing to bend the joint that movement is obtained, not by the gliding downwards of the upper fragment upon the humerus, as should be the case, but by a stretching of the union, the fragment remaining fixed ; and in such cases, although flexion may be effected to a great degree, and sometimes completely, extension power is almost, if not entirely, wanting. So much is this sometimes the case in exaggerated instances

that although the patient may be able to semiflex the arm or, perhaps, to flex it completely, if the limb is raised above the shoulder or by the side of the



FIG. 11.—MASSAGE AND EARLY MOVEMENT IN RECENT FRACTURES

Showing the amount of movement allowed in a case of fracture of the patella six weeks after the accident. The limb is shown in the two extreme positions, *i.e.*, complete extension and semi-flexion; the effect is produced in the photograph by taking the limb in the two positions on the same plate, as was done in figs. 7 and 9.

head the forearm falls down almost as in a paralysed limb in consequence of the triceps having lost its power from the fixation of the detached olecranon

to the lower end of the humerus. If in the treatment of such a case trouble be taken during its early progress to constantly move the detached portion of the olecranon upon the humerus by a little gentle flexion and by lateral manipulation, *care being taken that in flexion the detached fragment is made to follow the movements of the forearm*, which is easily done by making pressure upon it in a downward direction during passive movement, all adhesion is prevented and the patient probably recovers with a limb which is practically almost as useful as if there had been no fracture at all—the utility of the limb here, as in fracture of the patella, when the union is fibrous, depending upon the freedom of movement of the detached fragment as much as or, indeed, more than upon the actual strength of the uniting medium.

The two cardinal facts to bear in mind in the rational treatment of fracture of the patella and fracture of the olecranon are these: 1. The avoidance under all circumstances of any chance of the upper part of the patella or of the olecranon becoming adherent to the subjacent bone. Such adhesion may be prevented by massage and lateral manipulation combined with gentle flexion and extension, during which the detached fragment is made to move as much as possible with the distal portion of the limb—*i.e.* with the leg or forearm as the case may be—the lateral movement being the most

readily managed and resulting in the least disturbance of the parts generally. 2. All manipulation and passive movement should be preceded by smooth rubbing of the muscles. By this treatment you will in the majority of cases provide the patient with a limb which is useful to an extraordinary degree beyond that which follows when this plan is not used. I am, of course, speaking generally only, because occasionally a case treated by other methods without operation will leave a sound and good limb, but many of the cases so treated are very imperfect both in movement and in power.

When the fracture of an olecranon is treated by wiring, screws, or pegs the same cardinal points must be borne in mind. Massage and passive movement cannot be practised too soon, nor can the patient be encouraged too soon to use gentle voluntary movement at the elbow-joint.

I may perhaps be allowed a moment's digression here to explain, in order to avoid any misunderstanding, that the remarks which I have just made must not be held to imply that I have any wish to substitute in a general way treatment by massage and manipulation for the operative measures now so commonly employed in fractures of the olecranon and patella. I am second to none in my estimation of the value of these measures; but there must always remain a number of cases which, for reasons

which it would be foreign to my present purpose to discuss, are not suitable for operation—some in themselves, some because the patient does not desire operation, and some in consequence of the circumstances in which the practitioner finds himself being not such as to justify his undertaking operative measures. In such cases intelligent massage and manipulation will produce a better result than any other plan, and in many instances will restore the limb to a degree of usefulness which cannot even be excelled by operative treatment.

IMMEDIATE MASSAGE AND MANIPULATION IN DISLOCATIONS.

For the better understanding of the remarks which follow it is necessary to insist upon certain elementary points. If a dislocation is complete in the ordinary acceptation of the term the capsule of the joint must, as a matter of course, be torn, the rent in the capsule being of large or of small extent. The obstacles to the reduction of a dislocation depend comparatively little, as a rule, upon the situation or character of the laceration in the capsule; occasionally only do some of the difficulties met with in attempts at reduction lie with this structure. The real difficulty is for the most part due to muscular contraction—a fact which is amply proved by the manner in which most difficult

dislocations will often reduce themselves as soon as the patient is fully anæsthetised. The longer a dislocation remains unreduced the more marked does this contraction of the muscles become, and the more difficult is it to remove the bone from its abnormal site. Supposing that a dislocation remains unreduced for five, or six, or eight weeks in a joint such as, for an example, the shoulder, physiological shortening of the muscles takes place ; and in consequence a reduction of the dislocation by ordinary means may become practically impossible. I mention these facts, not because I suppose you are unfamiliar with them, but because I wish to emphasise as strongly as possible the importance of muscular contraction and shortening as obstacles to reduction in the vast majority of the dislocations with which we are ordinarily called upon to deal. For practical purposes the capsule and surrounding bony points may be ignored, since if they form any obstacle to reduction it is generally secondary to the condition of the muscles.

It is further a most important point to bear in mind that under ordinary circumstances after the reduction of a dislocation the retention of the replaced bone in its normal site depends not so much upon the state of the capsule, which in reality has little to do with the matter, as upon the muscles, aided in certain cases by atmospheric pressure. In

fact, the question of the healing of the rent in the capsule is of small importance compared with that affecting muscle-waste. The capsule will heal equally well whether the joint be kept fixed in splints or whether it be subjected to passive movement from the first. The muscles about the joint, especially those supplied by the same nerves as supply the articulation, waste rapidly if the joint be kept fixed for ever so short a time, and if the fixation be kept up for long periods this wasting may proceed so far as to be incurable. On the other hand, if massage and passive movement be at once commenced, then wasting can be entirely prevented, in the absence, of course, of actual nervous lesion. If the muscles are allowed to waste to any great extent, as you can easily see for yourselves by watching an ordinary case, the whole joint becomes loose and flabby. There is no such thing as a primary tonic condition of the capsule of the joint : the capsule of the joint is a passive structure, and has no contractile vitality of any sort beyond that which it derives from muscular attachments and expansions.

The prolonged fixation of a joint after the reduction of a dislocation allows the muscles to waste, which is tantamount to bringing about the precise conditions which tend to recurrent dislocation if attempts to obtain free movement are made at a later period. The effect of even temporary fixation of a joint in the production of adhesions which have sub-

sequently to be treated, often for long periods, I need hardly, I suppose, impress upon you ; although I fancy that if you were to examine a large number of patients who have had dislocations, say of the shoulder-joint, at a long period after the injury, you would be surprised to find that the percentage of cases in which some stiffness still persists from this cause is very considerable.

In the practice of the older school of surgeons prolonged fixation of a joint after dislocation was almost universal, the main object being to allow of a firm and rapid union of the rent in the capsule. So much was thought of the value of the healed capsule in retaining the parts in position that the disadvantages of adhesions and muscle-waste were held to be of no account compared with the vital importance of the completely restored capsule. I strongly recommend you to reverse these conditions by concentrating your attention upon measures for the avoidance of adhesions and muscle-waste. Ignore the torn capsule ; the rent will heal soundly in spite of any rational manipulations or movement it may be subjected to in treatment. Ingenious operations which from the nature of things cannot effect material good have been from time to time invented with a view to the cure of recurrent dislocation by shortening the loose capsules, the fact having been overlooked or forgotten that looseness of the capsule

is secondary to muscle-waste, which is the real thing to be combated. The only available method by which muscle-waste can be avoided in these cases of dislocation, especially of the shoulder, is massage, commencing immediately after the reduction of the displacement—smooth rubbing only for the first two days, after which passive movement follows the massage. *This passive movement may be very free in all directions save that which is towards the muscles which tend to waste. For example, in the case of the shoulder, abduction of the arm from the trunk should not be practised for a week or ten days after the injury, because the strong action of the adductors, unopposed for the time being by the weakened deltoid, tends to displace the head of the humerus inwards.* For the same reason in the first week no *voluntary* movement should be allowed, all movements being *passive*. Treated on these lines any dislocation of a major joint—e.g. shoulder or hip—may be cured in from two to three weeks without adhesions and with no stiffness remaining. At the end of a week, or at the most ten days, from the date of the injury, free voluntary movements should follow.

All cases of recurrent dislocation will be found to be associated with marked muscle-waste. The cardinal principle in treatment is in the direction of rectifying the atrophy of the muscles by massage and methodical exercises with or without electricity,

and not in the direction of shortening the lax capsule by operation.

The beneficial effect of massage in dislocations is not limited to the treatment after reduction ; it is sometimes of great use as an aid to reduction. The following case will serve as an illustration of this point. A highly sensitive and nervous lady, considerably beyond middle age, dislocated her shoulder in a fall which followed a slip on some parquet flooring. There was extreme pain, and the muscular spasm was intense, the least attempt to move the parts eliciting loud cries from the patient. Whilst waiting for the arrival of an anæsthetist, as the muscular spasm was so great, I gently massaged the region of the shoulder, upon which the pain was soon modified and by degrees disappeared. In the course of the rubbing I noticed that the muscles became less hard, and especially I observed that the *hollow tension* of the deltoid was succeeded by a feeling of almost softness. Seizing the favourable moment I passed my right hand into the axilla and with a sudden outward jerk reduced the dislocation easily (the displacement was sub-glenoid) ; in fact, had an anæsthetic been administered reduction could not have been more easily effected. In two other cases of dislocation of the shoulder of a similar kind, one being sub-coracoid, the other sub-glenoid, I have in the same way effected reduction with remarkable

ease. Cases like these show further the point I have already insisted upon—viz. the importance of concentrating your mind upon the condition of the muscles in cases of dislocation.

Before leaving the subject of dislocations allow me again to refer to the question of muscle-waste in these cases, because I do not think that in some instances it is sufficiently understood. In the case of the fleshy joints—*e.g.* the shoulder and hip—muscle-waste, unless the massage treatment is adopted, is too obvious to require comment. Wasting in the same manner occurs uniformly in all dislocations, although it certainly is not recognised by some people. The wasting, for instance, of the quadriceps in certain conditions of the knee is of common knowledge, but I venture to think that the wasting of the muscles controlling the ilio-tibial band is but little realised.¹ Again, it would at first sight seem almost impossible that any wasting of muscles should follow upon dislocations of distal joints like those of the phalanges of the fingers which are quite remote from muscular bellies ; yet in these it will be found, if examination be made, that there is universally some wasting of the forearm, and, further, that the permanent sense of weakening which is complained of by some of the patients who have suffered from these injuries can only be rectified by voluntary exercises or by thorough massage of the

¹ See *Injuries and Diseases of the Knee-joint*, by the present writer.

forearm muscles. The bearing of these points upon the scientific treatment of these injuries is too obvious to require explanation ; it is, I am sure, of much more importance than is commonly thought. It would, of course, be interesting to describe *seriatim* and in detail the management of the various dislocations throughout the body by immediate massage and passive movement, but time will not allow of this. I hope, however, that what I have been able to say will be sufficient to indicate the general principles upon which the treatment should be conducted. Its modification to the requirements of the different joints is merely a matter for the exercise of ordinary intelligence.

IMMEDIATE MASSAGE IN SPRAINS, WRENCHES, AND BRUISES.

As is the case with dislocations, the objects to be attained in the treatment of sprains, wrenches, and bruises are the restoration to the normal state by the rapid removal of effused products, the prevention of adhesions, and the avoidance of muscle-waste. Any treatment which fails to obtain these ends is defective. Further, it is, I am sure, undeniable that the only plan of treatment which will attain the desired end with certainty and in a reasonable time is that of immediate massage and very early passive movement—a plan which is, if intelligently used, appli-

cable universally, with the exception, perhaps, of a few special cases.

First, with regard to sprains. For our present purpose by a sprain is meant an injury to a joint, a muscle, or other soft part by a wrench, a bend, or a twist. There is always some laceration of the tissues, but there may be no open wound. In the case of a joint the injury always involves some tearing of the fibres of the capsule, synovial apparatus, or cartilage. There is pain of variable degrees, and there may or may not be effusion into the joint. Generally, if the sprain is of any severity there is effusion into the joint ; if the effusion follows immediately upon the injury it is blood ; if it follows a day or two subsequently it is due to synovitis. I must again crave indulgence for emphasising such elementary points. The occurrence of this laceration in cases of sprain—which means, of course, a subcutaneous wound—led to the faulty practice of former times, which is even now, I fear, far too prevalent, of placing parts so injured for a long period in splints : the best possible method for facilitating the formation of adhesions and the perpetuation of muscle-waste, the main object of this mistaken treatment being to allow of the rapid healing of the wounded tissues—a point of comparatively small importance.

In order to make clear the plan of treatment which I use, and which I strongly advise you to

adopt in these injuries, let us take the case of a man who has sprained his knee. At the time of his coming under observation—say, a few hours after the injury—the joint is painful, swollen from effusion (probably for the most part blood), and any attempt at movement of the joint is resisted. The first indication is the removal of the effusion. With this object the patient is, if possible, sent to bed and the limb is placed upon a light back-splint—a ham-splint being the most convenient—applied so that free access is left to the joint. Gentle smooth massage over the swollen joint is commenced at once. In very severe cases this is sometimes resented at first by the patient, whose resentment, however, soon subsides when he realises the soothing effect which the gentle rubbing produces. In the intervals of the rubbing fomentations of lead and opium may be laid upon the joint; the opium soothes somewhat, and the lead hardens the skin a little, which is useful in the subsequent management. From the first gentle passive movement of the patella is used, for the reasons which I have already sufficiently indicated. As soon as the effusion has distinctly commenced to subside, as is shown by the decrease in the tension of the joint, gentle passive movement (flexion and extension) is commenced, and if upon the commencement of the passive movement no increase of effusion occurs, the splint is put aside altogether. When the patient comes under treatment immediately after the

injury the splint can generally be dispensed with on the third day. With the discarding of the splint gentle massage of the thigh and leg is added to the rubbing of the joint itself, the passive movement and the massage becoming more and more thorough as the effusion subsides. A compress of the kind mentioned may be used in the intervals if it is comfortable to the patient. Treated in this simple way there are few cases of severe sprain of the knee in which the patient may not be getting about comfortably in a fortnight, at the end of which time another fortnight of methodical exercises, either in a gymnasium or by means of a 'home' exerciser, will generally complete the cure. I have taken as an example a severe case requiring confinement to bed. The treatment of the milder forms is modified to the necessities of the case, the great points to be borne in mind being the necessity for avoidance of the use of splints after the effusion has commenced to subside, the immediate use of massage to the joint, and early passive movement. In all cases the early movement should be passive—the habit of sending the milder forms of sprains at once to the gymnasium is to be avoided. In no case of sprain should a cure be considered to have been obtained if any sign of wasting of muscle beyond that which comes from mere disuse remains. The longer the time which intervenes between the receipt of the injury and the commencement of the rational treatment the greater

is the difficulty in rectifying the muscle-waste with its necessarily concurrent weakness, and in cases in which the parts have been long confined in splints a cure in the true sense is sometimes impossible.

The following points in the carrying out of passive movement in cases of sprain are of some moment. The first movement used should be those of the simplest kind ; for example, flexion and extension in the hip or knee, antero-posterior movement in the shoulder ; abduction and adduction should then follow, and finally rotation and circumduction in joints permitting of that movement. This sequence, however, is always interrupted for the following reason, which is of paramount importance : *the last movement to be practised should be that which, so far as can be ascertained, was concerned in the production of the injury.* Let me make myself clear. Suppose for a moment that a severe sprain of the shoulder has been caused by a fall on the hand or elbow, the arm having been at the time widely abducted from the side ; the damage will be probably about the inner aspect of the capsule or under the acromion. In such a case passive abduction should be the last movement practised, as it would be the movement most likely to irritate the part immediately lacerated or bruised. Although it should be the last movement to be commenced it should not, however, be long deferred, seven days being probably the limit of time which can with safety be spared before its commencement.

Again, in the sprain occurring in internal derangement of the knee-joint the injury is almost always caused by either internal or external rotation. In such a case, therefore, the last movement to be practised is rotation. Indeed, it is, speaking generally, better to avoid rotation altogether in that particular class of case.

In sprains complicated by external wound it is clear that the plan which I have been advocating cannot immediately be adopted in its entirety, nor can massage be comfortably practised directly over the damaged part when the skin is abraded or raw ; but in such circumstances massage of neighbouring muscles and passive movement should always be practised, the peculiarities of each case dictating the modifications which are necessary in the application of the treatment.

I had intended giving some details of the treatment of simple bruises by the same plan of massage and movement, but the allotted time has been more than spent. All, therefore, that I can say is that in these cases the method of its application and the objects are the same as those already mentioned—viz. the rapid removal of effusion and the prevention of matting of the injured parts.

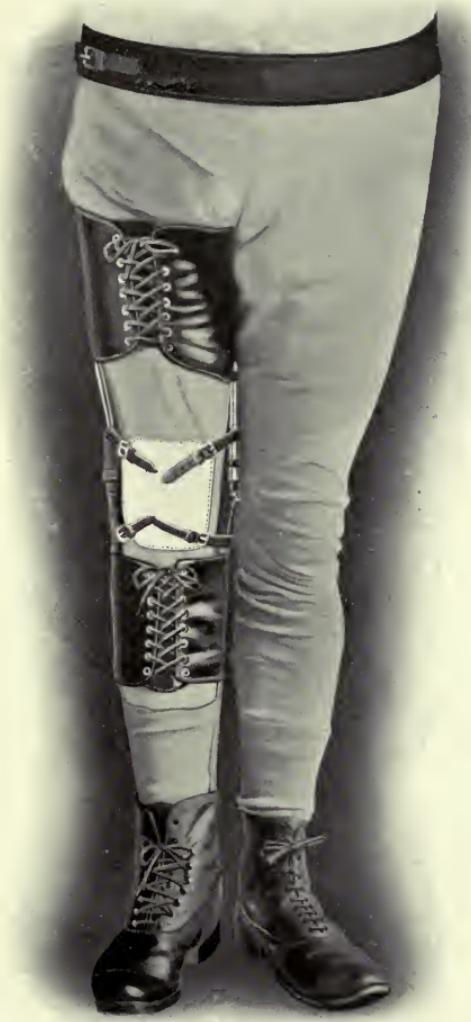
In conclusion allow me to say that I have no desire that the treatment which I have been now advocating should be used to the exclusion of all others. My main object is to urge upon you the

desirability of shaking off to some extent the incubus of the traditional routine treatment of fractures and the other kinds of injury of which I have been speaking by prolonged splinting, strapping, counter-irritants, and so forth, and, unless unavoidable circumstances prevent, to substitute a line of treatment which is, I am sure, rational, and will in the end be found by anyone who will take the trouble to acquire a personal experience of it, to produce in a general way results far superior to those obtainable by other plans.

THE AMBULATORY TREATMENT OF FRACTURES.

This may be regarded as a modification of the method of treatment by massage and early movements ; it is, therefore, conveniently referred to here.

The main principle of the treatment is the application of some form of instrument or immobilisation apparatus by which the fragments are retained in position in such a way that the upright position may be assumed during the healing of the break, the patient being allowed very early in the course of the treatment to bear weight upon the limb. It is a method which has not made any great progress in this country, partly, I fancy, because of the expense entailed in sometimes obtaining the adequate apparatus, although the main object is partly attained by those who adopt the immediate use of plaster of



Ernst's Instrument for Ambulatory treatment in slow or delayed union
in fracture of the thigh.

Paris and other similar means of immobilisation in fracture of the legs, a region to which this mode of treatment must be for the most part limited in consequence of the difficulty of obtaining an efficient apparatus or arrangement in cases of fracture of the hip and thigh.

Although such arrangements may be obtainable in specially favourable circumstances, it is obvious that for the ordinary practitioner the method can hardly come within the limits of practical work, at all events so far as recent fractures are concerned.

In delayed or soft union, however, the matter is different ; in such cases there is, in my experience, no more efficient plan, short of operation, of bringing about a proper union than fitting the limb with a skilfully made apparatus which, whilst it prevents undue pressure between the fragments and bending of the parts at the seat of fracture, allows a patient to walk about with or without the aid of a stick or crutch. Plate V shows an efficient apparatus adapted to a case of delayed union in a fractured femur, and Mr. Ernst has contrived for me an admirable high boot containing concealed steel supports with a joint at the ankle which has given truly excellent results in similar conditions of the leg. It is moreover the best means with which I am acquainted of getting a patient rapidly on his legs after an ordinary fracture of the tibia or fibula.

LECTURE III

SPRAINS AND THEIR CONSEQUENCES, MAINLY IN
RELATION TO TREATMENT.

THE commonly-reckoned 'little things' of surgery are, it must be admitted, not popular with surgeons generally at the present time, when the great achievements of operative work are apt to overshadow so completely the treatment of minor ailments, that they are frequently relegated to the category of cases too uninteresting to call for much attention at the hands of those who are mostly concerned in dealing with matters which are apparently more important. Unless, therefore, I had been asked to do so, I should not have presumed to contribute to the 'British Medical Journal' an article upon such a trivial subject as sprains.¹ It is, nevertheless, probable that the neglect or indifferent treatment of some of these minor matters results in more disability among the community generally, especially the wage-earning classes, than would arise from a considerable percentage of the cases which are considered to

¹ December 8, 1906.

require operation if they were left alone ; and, further, it is undeniable that, if the minor things were always adequately treated at their commencement or when they threatened, operations would be less frequently necessary.

DEFINITION AND CLASSIFICATION OF SPRAINS.

A reference to the latest textbooks will give but scanty information on these points ; indeed, excepting sprains of joints, little mention is made of them.

A few years ago the definition of a sprain was 'a wrench or strain resulting in stretching or laceration of the soft parts, without external wound.' Academically this definition may still be regarded as sound, but for working purposes it has been conclusively shown by the *x*-rays that sprains commonly so called are in quite a large proportion of cases complicated by slight fractures, a very important point in relation to treatment. In fact, under the usual nomenclature a good percentage of sprains should be classified as fractures. The fracture, however, in these cases is of subordinate importance in a pathological sense, because the sprain of the soft parts is the predominating feature. A fracture can hardly occur without a sprain at the same time, but a sprain may of course, and frequently does,

occur without a fracture. For my own convenience I am in the habit of classifying sprains as follows :

1. Simple sprains involving the soft parts only.

2. Sprains with fracture, by which I mean a sprain complicated by a fracture, the symptoms of which are so slight as to make it undiagnosable under ordinary circumstances, the symptoms of sprain being altogether predominant.

3. Sprains with gross nerve injury.

For clinical purposes this classification will be found not only reasonable but useful. Speaking generally, then, a sprain may be considered as a subcutaneous laceration ; at the same time, it must be allowed that certain parts may be susceptible of stretching, without actual tearing, to a degree that will cause great pain. Hence, for working purposes, sprains may be divided into those associated with swelling and those followed by pain and stiffness only, the latter condition being formerly spoken of as 'strain.'

Immediate swelling means, of course, blood extravasation or the contraction of the proximal portion of extensively ruptured muscle ; deferred swelling in the immediate region of the injury being due to inflammatory exudation into the soft parts in the continuity of a limb or about the trunk, or, in the case of a joint, synovial effusion.

In relation to the question of swelling, it must be

borne in mind that the possibility of defining it is in direct proportion to its nearness to the surface of the part. A swelling from extravasation on the deep surface of the erector spinae would be quite intangible, whilst in the quadratus femoris it would be easily felt; moreover, it must be remembered that deferred or remote swelling in deep sprain may show itself a long way from the seat of the original injury, in consequence of its being caused by the blood tracking along the fascial planes in the line of least resistance. I have, for example, recently seen a large hæmatoma below the buttock show itself a week after a severe sprain of the erector spinae whilst fencing, and I have seen a large blood tumour appear in the popliteal space many days after a sprain of the upper part of the thigh.

DIAGNOSIS AND TREATMENT.

The first essential in all cases of sprain is to determine whether fracture co-exists, which can readily be done by the *x*-rays when they are available; it should, indeed, be an accepted practice that, when possible, every sprain, especially those near joints, should be examined by the *x*-rays. In the event of the *x*-rays being unobtainable, it is wise to regard any case in which the symptoms of sprain near a joint are unduly exaggerated as being

complicated by fracture, especially if the parts concerned be the phalanges of the fingers or the metacarpal region. Plates VI, VII and VIII are from *x-ray* photographs of cases of so-called sprain in which the bone lesion had been undetected until revealed by the *x-rays* some time after the injuries had occurred.

The frequent overlooking of bone lesions in so-called sprains seems to be greatly due to the fixed idea on the part of many people that crepitus is a necessary symptom of fracture, and that absence of crepitus means absence of fracture: a sadly mistaken belief, inasmuch as, it need hardly be said, fracture often occurs in circumstances in which the detection of crepitus is impossible. On the other hand, crepitus after injury, especially if near a joint, may be elicited when no fracture is present. I have seen several cases of injury near joints in which fracture has been either diagnosed or strongly suspected on the strength of crepitus resulting from osteo-arthritis in the adjacent articulation.

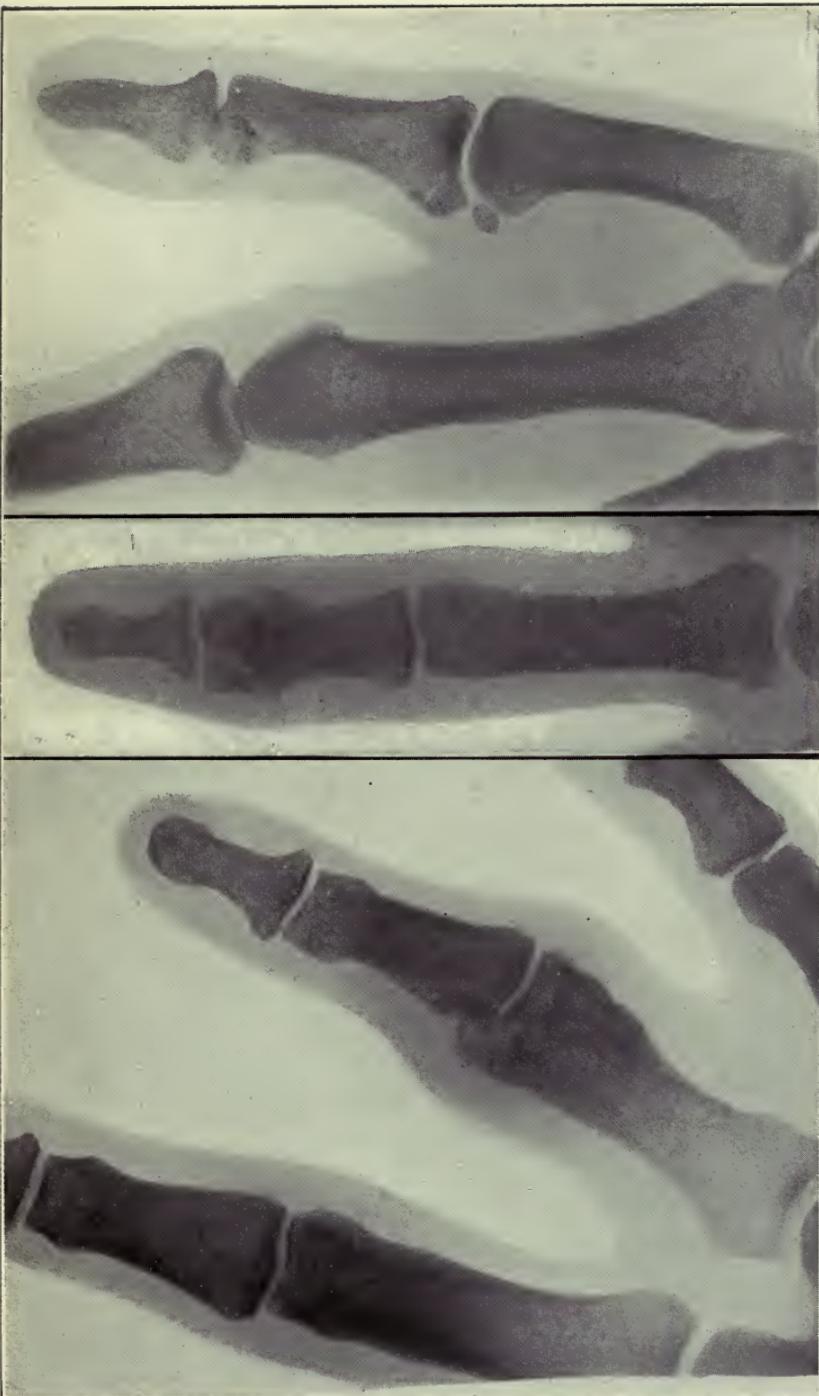
The next desideratum is to eliminate the existence of gross nerve lesion. Speaking generally, the pain in cases of sprain is referred to the seat of injury. Should it be referred to a distant part, to the side of the foot, for example, in a case of sprain of the knee, definite nerve lesion is indicated. In all cases of sprain, especially of the knee, elbow and shoulder

FIG. III.

FIG. II.

FIG. I.

FIG. I.—A very exaggerated case of undetected fracture of the finger, showing deformity arising as in fig. 12. The case came under observation about six months after the injury, as the appearance and character of the swelling around the part suggested tuberclosis. FIG. II.—Fracture of head of phalanx of finger shown by a-ray after two months' treatment for sprain. FIG. III.—Fracture of base of proximal phalanx of thumb after six months' treatment for sprain. Acute pain was the symptom complained of, which rendered the hand quite useless. Removal of the ununited fragment effected a cure.



regions, the distal parts should be examined for numbness, a much commoner condition than it is usually supposed to be, and one which is frequently, when it does exist, at first unnoticed by the patient. This numbness, which may be exceedingly limited in area, if due merely to nerve shock disappears in a few hours ; if, however, it persists for more than twelve hours a gross lesion of the nerve branch concerned is pretty certain.

Simple Sprains.—Setting aside cases complicated by fracture on the one hand and by nervous lesion on the other, sprains may be, for purposes of treatment, divided into two classes—those with swelling and those without, the latter being a very small minority, which is practically limited to sprains about joints and amongst the deep muscles of the back and neck.

Sprains without swelling (formerly called 'Strains'). Here the main immediate indication is the relief of pain, which in these cases is frequently intense. Rest of the part, combined with very firm compression of the region immediately concerned, is usually effectual in this respect if the pressure is of the right kind ; and I know of no means of applying effectual pressure excepting strapping, which should, if obtainable, be to a certain extent resilient, like, for example, the wash-leather strapping made by Messrs. Ewen & Son, which is ideal for this purpose. It is,

however, perhaps too expensive for ordinary use, the best alternative being Leucoplast, which, although made in Germany, is in my experience so far superior to the English varieties of the same thing that my patriotism does not prevent my using it. (It should be borne in mind that the real object of the use of strapping in these cases is to give support, and hence rest, to the part; its proper application is therefore a matter of some moment, especially in parts constantly moving, like, for instance, the chest wall. In sprain of one side of the chest the strapping should, of course, be made to include at least two-thirds of the circumference of the thorax, passing well beyond the middle line in front and behind, the application of each strip being made quickly at the end of a complete expiratory effort. An apology is needful for these elementary details, but my experience shows that some little facts of this kind are not familiar to us all.) The immediate pain having been thus relieved, massage cannot commence too soon; but passive movement in these cases is better deferred for six or seven days, as secondary swelling is apt to follow its use if employed too soon. Voluntary movements by the patient may, however, be allowed from the first, the extent of these movements being determined by the amount of pain; as a matter of fact, in many of these cases, as well as in some other varieties of sprain, voluntary movements by

the patient are frequently a source of immediate comfort.

Sprains with Immediate Swelling (from Blood).—The classical indications here are threefold : (a) Arrest of bleeding ; (b) promotion of absorption of extravasated material ; (c) prevention of adhesions and muscle-waste.

(a) With regard to the first indication, I do not think local treatment other than rest has any material effect. I have rarely seen the application of ice do anything but harm, although in an occasional case the instinct of the patient may lead to its being suggested. At all events, it is wise, if its application should be decided upon, to ascertain, especially in middle age and later, whether the kidneys are sound, for I have seen three cases in which extensive sloughing followed the continued application of ice in sprains with swelling in confirmed albuminuria, no precaution having been taken before the adoption of the treatment to inquire as to the possibility of renal disease : an excellent example of the way in which the apparently trivial nature of a case may lead to careless treatment of it. So far as the comfort of the patient is concerned, a fomentation, the hotter the better, has served my purpose best. Pressure during the increase of immediate swelling I do not use ; it is as often as not distressing to the patient, and frequently produces oedema of the

tissues below, if the part concerned is a limb. To sum up, rest of the part with very hot fomentations are the means I have come to rely upon.

(b) The increase of the immediate swelling having ceased, should the part involved be a joint, firm pressure by means of a porous bandage, such as crêpe velpeau, firmly and evenly applied for twenty-four hours, followed by massage, gives the best and quickest results. The use of impermeable rubber bandages I have long since given up. Should massage not be available, skilfully-applied strapping is the best alternative, the frequency of its renewal being determined by the rate of diminution in the swelling. If the sprain be of the soft parts without joint complication, hot soothing compresses, such as the old and well-tried lot. plumbi cum opio, frequently changed, are more helpful than any other means, so far as I have seen, the pressure being increased as the swelling subsides. As soon as appreciable diminution in the swelling has occurred massage is indicated unless the part is abnormally hot to the touch.

(c) For the prevention of adhesions and muscle-waste, voluntary movements, massage, and passive movements rank in the order mentioned. Slight voluntary movements cannot be commenced too soon; splints, therefore, should in a general way not be used. The patient should, in fact, from the

earliest moment amuse himself by seeing how far the part, if a joint, can be bent without permanent increase of discomfort. Massage should not, except in special circumstances, be delayed for more than twenty-four or at the most thirty-six hours after the cessation of increase in the local swelling. Passive movements should follow freely as soon as all heat has left the damaged part, whether the swelling be tense or not ; and if the tension be rapidly diminishing gently passive movement may be used in spite of slight local increase of heat ; but if the increase of the heat, which under these circumstances is sure to follow, does not subside within an hour or two, passive movement should be deferred for a time, although voluntary movements may be continued.

When an interval occurs between the receipt of the injury and the oncoming of the swelling, and in cases in which swelling, having followed directly after the injury, reappears after it has entirely disappeared or nearly so, the line of treatment mainly depends (1) upon the absence or presence of heat, and (2) in the case of joints upon the amount of tension.

In the absence of local heat, free massage and manipulation are indicated, combined with firm elastic (not rubber) pressure. In effusion without heat occurring in joints a fortnight or more after the accident, the possibility of syphilis or gout as

contributing factors must not be overlooked. Iodides in some form internally are often helpful, especially when combined with free inunction of vasogen iodine locally. I know of no application which ensures the local effects of iodine without irritation to the same extent as this.

In well-marked hæmatoma in easily accessible soft parts coming on immediately after sprain, the course of the case may be greatly shortened by free incision and cleaning out of all clots, followed by immediate suture of the wound.

Tension in Joints after Sprains.—This may be immediate or secondary, that is, occurring after an interval varying from two or three days to a week. When occurring later than this it may be regarded as due either to a repetition of injury, or to some constitutional cause—for example, syphilis, rheumatism, gout, septicaemia, &c.

Tension is always associated with local heat, although in some cases this is very slight; the more quickly a high degree of tension follows the injury the greater is the heat; the same may be said of the pain, which, in immediate tension, is sometimes of great intensity. Hence it is the pain from which relief is sought. Rest, of course, is essential, and if this, aided by very hot fomentation, fails to give comfort, direct relief by means of the aspirator is the indication. This in the hands of a competent

practitioner who understands the value of cleanliness is not only more effectual than the alternative usually recommended, namely, leeches, but is also, I think, safer. I have seen no harm follow aspiration, which I cannot say in the case of leeches. The withdrawal of only a sufficient amount of the bloody fluid to relieve the tension should be made, as this is less likely to be followed by a recurrence than when as much fluid as possible has been drawn off. The tendency to recurrent tension in cases of this kind is also, I have reason to believe, diminished by the administration internally of calcium chloride. In the case of tension coming on after an interval, on the other hand, if relief by aspiration becomes necessary, as much fluid (synovia) should be removed as possible, and firm pressure immediately applied. After the relief of tension, the use of massage and movement, voluntary and passive, will be regulated entirely by the behaviour of the local temperature of the part, to which reference has already been made.

Sprains with Fracture.—The treatment of these injuries differs only from that of simple sprains in the following particulars: Although massage may be, and as a rule should be, commenced at once, rest for the part in splints of some kind must be maintained for a long enough period to enable the detached piece of bone to reunite sufficiently to retain its position during voluntary movements. Hence, as early

movements are essential to quick recovery, these must be passive, and not voluntary, as in simple sprain. This is a most important point in the treatment in these cases, especially in connection with deformities following sprains—a matter with which I shall deal presently. The treatment of simple sprains may be tabulated thus: (1) Voluntary movement, (2) massage, (3) passive movement and exercises; whilst that of sprains with fracture would run: Massage, passive movement, voluntary movement and exercises; the reason for the early use of passive rather than voluntary movements being obviously that the detached piece of bone is not disturbed during the use of passive movement if properly carried out; whereas, if voluntary movement were allowed, imperfect or faulty union would not improbably follow with the usual imperfect recovery.

These remarks apply only to cases in which there is a definite detachment of a portion of bone; they have no bearing upon cases of so-called 'sprain-fractures' in joints in which the cartilage is in part torn from the articular surface, the bone being involved in the lesion. The treatment of such cases, which are generally undiagnosed if they often occur, differs in no respect from that of simple sprains.

Sprains with Gross Nerve Injury.—Of all cases of sprain, these are in some respects the most important, because of the difficulty in their treatment and

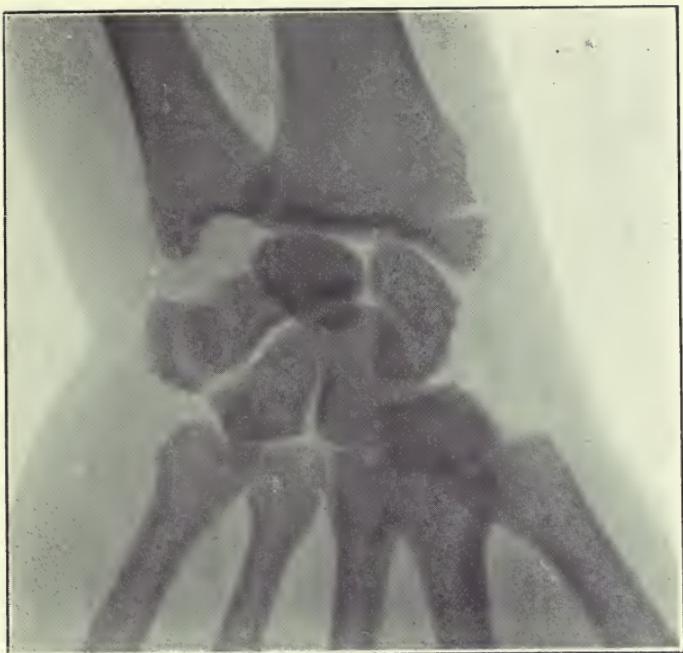


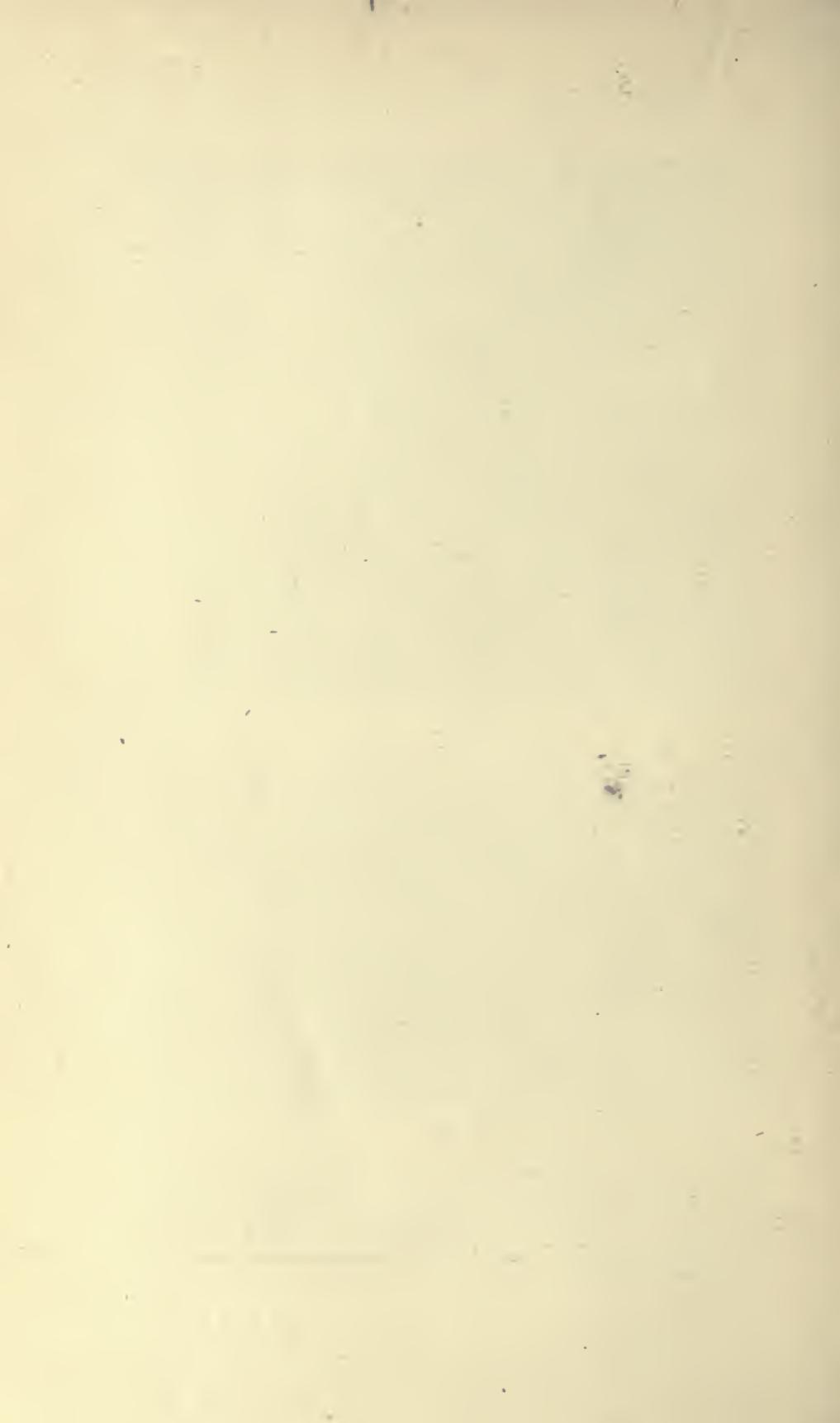
FIG. I.



FIG. II.

FIG. I.—'Motor sprain' of wrist. Separation of styloid process of radius, caused by attempt at starting the engine of a motor car. Fracture discovered by use of *x*-rays some time after the injury.

FIG. II.—'Motor sprain.' Comminuted fracture of lower end of radius, caused in the same way as fig. I. There was no deformity; the fracture had not been detected until shown by *x*-rays three months after the injury.



the resulting imperfect cure which so commonly follows, although it must be admitted that the defective recovery is not generally attributed to its real cause. As is the case with sprains with fracture, many of the imperfect results are due to indifferent diagnosis, the nerve lesion having escaped notice in consequence of the slightness of its symptoms at the time of injury. Hence, as I have already said, the importance of a definite search for evidence of nerve damage in cases of sprain cannot be over-emphasised.

In the treatment of these cases, when the evidence of nerve lesion is pain along the line of distribution of the nerve, rest and rest only will bring about a complete and permanent cure. This rest, if it is to be successful, must be continued until all symptoms of nerve pain have passed away. Herein lies the difficulty in treatment, for it is next to impossible to induce some patients to realise the importance of resting the part concerned long enough to ensure immunity from the persistent pain which is prone to follow in these cases. Massage does nothing but harm in the early stages of this type of case, but if the condition becomes chronic from neglect of treatment in the early stages, it may be of use, especially if associated with static electricity ; and the exacerbation of pain in chronic cases is frequently greatly relieved by the repeated application of the fine point of the thermocautery along the line of pain.

In cases where numbness is the indication of nerve lesion the treatment is altogether different, for if this symptom has not disappeared in 24 hours the only hope of cure lies in the skilful use of massage supplemented after two or three days by galvanism. If the affected part be a limb, exercise should be encouraged, and in any part flying blisters *over the seat of the lesion* may be safely used, since in a certain number of cases they do good, and in none does harm arise from their employment. It is singular how readily areas of numbness may sometimes escape the notice of both surgeon and patient. In a case which came under my observation a patient having 'sprained' his leg was entirely unaware of any loss of sensation in the foot until, in attempting to get some warmth into the part, he found he was charring his toe by unconsciously holding it in contact with the bar of the grate.

REMOTE CONSEQUENCES OF SPRAINS.

The later consequences of sprains may be tabulated in the following way :

Preventable ..	Persistent pain.
	Stiff joints.
	Wasting of muscles (apart from gross nerve lesion).
	General relaxation of joints.
	Deformity.



Impacted fracture of the malleolar end of the fibula, frequently diagnosed as 'sprain,' the cardinal signs of fracture being absent. It is believed that this impacted fracture has not hitherto been described.

Unavoidable
in
certain cases. { Osteo-arthritis.
Local paresis.
Myositis ossificans.

PREVENTABLE CONSEQUENCES OF SPRAINS.

Persistent Pain.—This condition is usually caused by excessive immobilisation in ordinary cases giving rise to adhesions and matting of the parts, but it may be due to too early movements in cases associated with nerve lesion. Speaking generally it may be said that in simple sprains the discriminating use of massage and movement cannot be commenced too soon after the immediate effusion has ceased to increase; on the other hand, if nerve lesion *with pain* exists, rest is essential until the pain has passed away.

Stiff Joints.—Stiffness of joints after sprains is almost always due to the prolonged use of splints or delay in the commencement of voluntary and passive movements. Stiffness of this kind can be nearly always avoided by the removal of splints, if their use is considered necessary, once daily for an hour or so, during which the patient is encouraged to move the part as much as the pain will allow. It appears that one of the main reasons for the prolonged use of splints in sprains of joints is the fear of tubercle, but in the absence of persistent local

heat it is hardly needful to say that the fear of tubercle is entirely unnecessary.

Recently I have seen a case in which, in consequence of acute effusion into the knee-joint after sprain, the part was immobilised in splints for six months, with the result that a bony ankylosis followed. Nothing can be more harmful in sprain of joints than the too prolonged use of splints. Personally, in sprains—the existence of fracture having been excluded by the use of the *x*-rays—I have long since given up the use of splints altogether.

General Relaxation of Joints.—This, the exact reverse of the condition just referred to, may, in the absence of very extensive laceration of the capsule, &c., for practical purposes be considered to be due to wasting of muscles on the proximal side of the articulation, the knee for many reasons being the joint mainly concerned. Wasting of the muscles of the thigh invariably leads to laxness of the capsule of the knee-joint, and the bagginess of the capsule thus resulting means passive effusion, a fact which does not seem to be familiar to some people. The resulting fulness of the joint, especially when the patient stands, leads the inexperienced to devote the entire attention to the 'fluid in the joint,' with the result that one of two extremes in the way of treatment is adopted—(1) prolonged use of splints, or (2) vigorous methods confined to the joint itself—

for example, blisters, actual cautery, strapping, &c., the result being almost invariably a 'wobbly' joint.

If, in cases of this kind, it were generally recognised that the primary factor of importance is the muscle-waste, the condition of the joint being secondary, the number of lax joints would be very small, because, with very few exceptions, the condition follows only in cases improperly treated. If voluntary movements be commenced sufficiently early, whilst the patient is resting, and are aided by massage, and later on by passive movements *plus* resistance exercises, muscle-waste will be entirely avoided unless the injury has caused gross tearing of muscles, especially at their aponeurotic or tendinous attachments; for example, the muscle-waste in 'rider's sprain' (laceration of the tendon of origin of the adductor longus in the thigh) is rarely, if ever, so far as I have seen it, completely repaired.

Deformity.—This is in some respects the most interesting of the remote preventable results of 'sprains' so-called. These deformities are met with most commonly in the fingers, but are also seen in the knee, in the form of genu valgum principally; in the hip, and at the wrist and ankle. In adults they are virtually always the result of undetected fracture; in growing people they may arise from injuries to the epiphyses, but even in these subjects

undetected fracture is the commonest cause.¹ Sprain of an epiphysis may cause arrest of development or irregular growth, the best example of the latter condition being certain cases of genu valgum.

Fig. 12 is a diagram showing the mechanism of a characteristic case of deformity of a finger following 'sprain.' There has been an oblique fracture of the

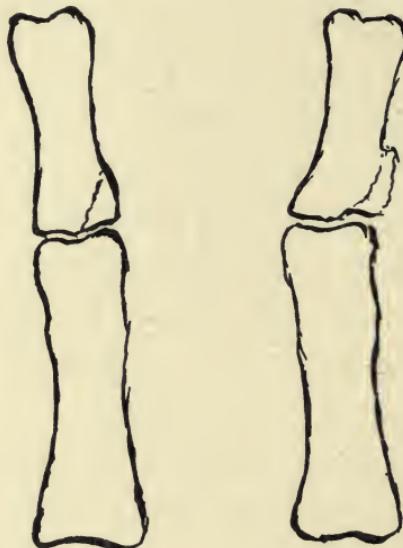


FIG. 12

Diagram illustrating the mechanism of deformity following upon undetected fracture of base of phalanx of finger.

base of one of the phalanges; the fracture having been undetected, no means were taken to secure adhesion of the separated part during the use of

¹ In three cases of 'motor sprain' in young subjects which came under notice the x-rays showed separation of the lower epiphysis of the radius.

massage, &c. The result is that the fragment has glided upwards in such a way as to cause the distal part of the finger to fall over in an angular deformity.

Plate VI A shows a skiagram of a case of a very exaggerated kind in which the same distortion is in course of occurrence. Such deformities of the fingers after sprains are not unfrequently attributed to osteo-arthritis; genu valgum and genu varum may arise in the same way. The following is a typical example.

A young man, twenty-two years old, strong and healthy, consulted me on account of genu valgum of an exaggerated kind, which was said to have come on rather rapidly during the convalescence from a severe sprain of the knee. An *x*-ray photograph clearly showed that the external condyle had been detached by an oblique fracture and had glided upwards, so that when attempts at walking were made the leg necessarily bent outwards from the knee.

A few years ago 'sprains' of the hip were spoken of as being sometimes followed by shortening of the limb from a mysterious change in the bone, which was thought to bring about an alteration in the angle at which the neck of the femur left the shaft. The *x*-rays have abundantly shown that the common cause of this deformity is undetected fracture of the neck of the thigh-bone, and in a few cases perhaps injury to the epiphyses in growing subjects.

It is a singular thing that there is even now a disinclination upon the part of some people to utilise the *x*-rays in cases of sprain. Recently an instance has come to my knowledge in which a practitioner of large experience and repute advised against the use of the *x*-rays on the grounds that they would merely corroborate his diagnosis in a case of 'sprain' of one of the larger joints. Symptoms having subsequently arisen which were hardly consistent with a mere sprain, however severe, the *x*-rays were employed, upon the recommendation of another authority, with the result that a very manifest fracture was revealed.

An attitude of this kind towards a means of diagnosis which in competent hands can set at rest once and for all any question as to fracture with absolute certainty passes the comprehension of a person of only ordinary intelligence.

UNAVOIDABLE CONSEQUENCES OF SPRAINS.

Osteo-arthritis.—The relation of osteo-arthritis to injury cannot be said to be much understood; it is, however, quite certain that its first manifestation frequently follows upon some comparatively slight injury to a joint, especially if this is followed by effusion. The subject generally is too large for discussion here, but it is, I think, undeniable, if my own

experience is of any value, that excessive immobilisation of joints after injury tends to the development of this condition. In other words, the chances of osteo-arthritis developing after injury is much greater when unnecessary rest has been used than when, by massage and rational movements, the parts have been kept supple from the commencement.

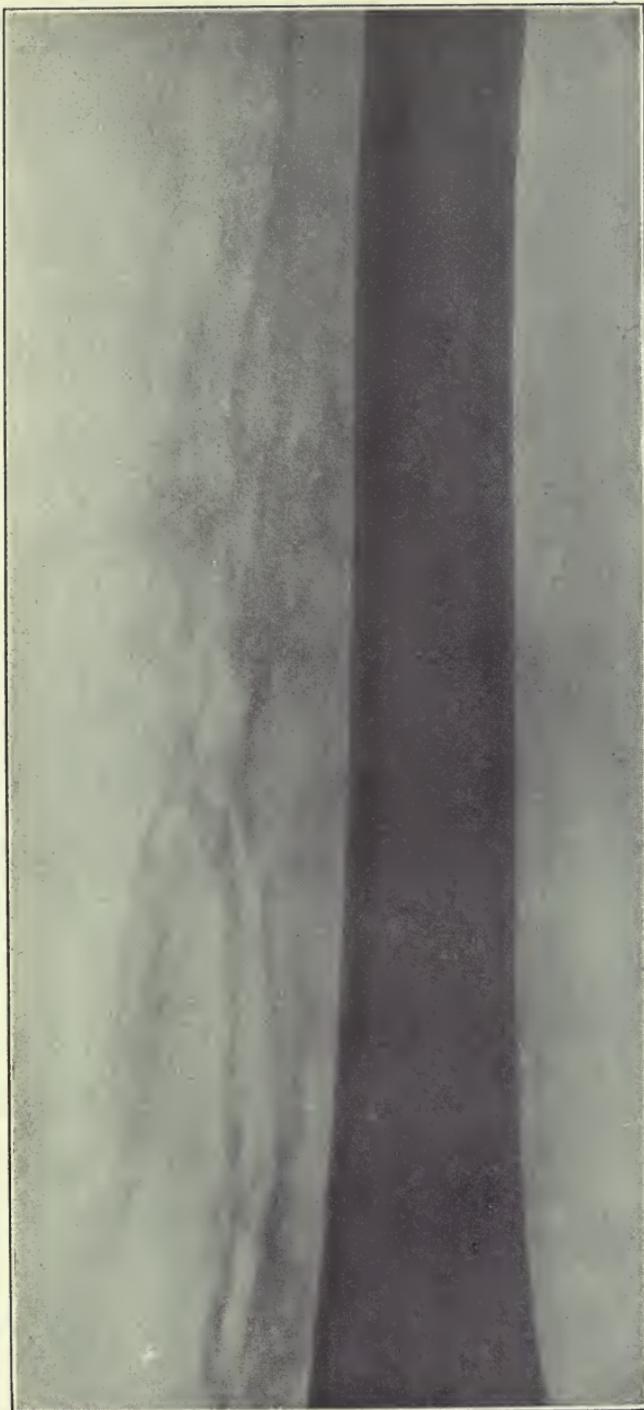
Local Paresis.—Gross nerve lesion may, of course, result in permanent loss of power, in spite of the most skilful treatment ; but it is often of much moment that the practitioner should be able to warn a patient of the possibility of results of this kind ; hence, as has been already indicated, the desirability of ascertaining immediately after the injury whether nerve complication does or does not exist is a matter of some urgency.

Traumatic Myositis Ossificans.—This is, perhaps, the rarest, and at the same time the most interesting of the remote consequences of sprains. Sprains of muscles, involving as they may do the points of attachment to the bone, may be followed, especially in the case of the quadratus femoris, by gradual ossification, completely or in part. The process is slow and little, if at all, painful, such pain as may be felt being of the nature of a dull aching or feeling of weight. The joint controlled by the ossifying muscle becomes increasingly restricted in its movements. For example, in myositis ossificans of the quadratus

femoris flexion at the knee becomes slowly less and less, although it is rarely that flexion to a right angle cannot be ultimately accomplished. The muscles involved become hard and seem to be exaggerated in size; there is little or no tenderness, but the limb becomes more and more heavy as the disease goes on. The liability to this condition seems to be too little understood.

Plate IX is a skiagram of a portion of the thigh of a woman about 24 years of age, by whom I was consulted in consequence of amputation having been advised on account of sarcoma. In another case which came under my notice amputation had been suggested by a very experienced surgeon on the same grounds. Again, within the last six months a naval officer was referred to me on account of a large mass involving the middle of the thigh after an injury, which had been regarded as malignant disease. In this case as in the others with which I have met, the *x*-rays showed superimposed layers of calcification arranged in accordance with the muscle structure as shown in Plate IX.

With regard to the treatment of this condition it seems certain that, once it has actually commenced, rest is essential until it has ceased to increase; massage and movements, passive or voluntary, during its progress, undoubtedly stimulate it to increase. Operation in some of these cases has been



Myositis ossificans of quadratus femoris following sprain of the thigh. The photograph was taken fifteen months after the injury. The disposition of the layers of calcification is characteristic.

adopted, masses of bone-like material having been removed, but unless the periosteum with which some of these masses are connected is also completely removed, regrowth with increased vigour follows. Operation is, in fact, generally harmful, and should be rejected. Rest having been used until the tendency to increase in the condition has ceased, massage and exercise should follow, with a view to obtaining as much usefulness as possible in such portions of the muscle as have remained intact. The alteration in the bulk of the muscle remains permanently, the normal state is never recovered. The comparative painlessness of the condition should make it difficult to confuse it with periostitis, the lesion for which it is generally mistaken.

Plate X shows traumatic myositis ossificans after a sprain of the elbow—the possibility of fracture having been originally eliminated by the *x*-rays. Massage and exercise were tried in this case, with the result of steadily increasing the bulk of the mass ; subsequently complete rest for six months caused a diminution to about one-half of the previous size.

The relation of tuberculosis of joints and of tendon sheath to sprain is of much interest, but its discussion is outside the limits of the present lecture.

LECTURE IV

STIFFNESS OF THE SPINE.

IT is, I presume, hardly needful to say that symptoms are not always in proportion to the gravity of the disease by which they are caused, since it is common knowledge that grave disease may exist without noticeable symptoms, and that distressing symptoms may be associated with comparatively trivial complaints. It would be difficult to find a better illustration of this fact than that provided by certain cases of rigidity of the spinal column, a condition which, on the one hand, may be a symptom of the greatest moment, and on the other may be of no real importance at all provided that an accurate diagnosis of its causation be arrived at.

The cases included in the following table, which represents only those examples which have come under my personal observation, and is not intended to be a complete list, will show how large a field the question of rigidity of the spine covers, and how many factors are concerned in its production, more, I fancy, than are ordinarily realised :—

TABLE OF CAUSES OF STIFFNESS OF THE SPINE WITHOUT VISIBLE DEFORMITY, AND EXCLUSIVE OF ACUTE CONDITIONS.

PERSISTENT . . .	Tuberculous disease
	Osteo-arthritis
	<i>Spontaneous Ankylosis (Sepsis ?)</i>
	Effects of Empyema
	Malignant Disease
	Hydatid of Vertebrae
	Aneurysm
	<i>Old Fracture</i>
	<i>Traumatic Myositis Ossificans</i>
	<i>Congenital peculiarity</i>
INTERMITTENT OR RELAPSING	Senile rigidity
	Neurosis. N.B.— <i>Neuro-mimesis</i>
	Chronic Rheumatism, Muscular and
	Fibrous
	Worms
	Reflex <i>Movable Kidney</i>
TEMPORARY OR TRANSIENT	<i>Renal Calculus</i>
	<i>Stone in Ureter</i>
	<i>Hip Disease</i>
	Early Tuberculosis
TEMPORARY OR TRANSIENT	Gumma
	Sprains and Wrenches
	<i>Rickets</i>

NOTE.—The lines in italics refer to the less commonly recognised causes of stiffness of the spine, and are those towards which the remarks in the lecture are mainly directed.

The whole subject is, as can readily be seen, a large one. All that I propose now is to call attention to certain broad features in some of the varieties of spinal stiffness, with a view especially to combat an impression which seems to be far too prevalent, that anything like pronounced rigidity of the spine, in the absence of congenital and acquired deformity, is a strong indication of tuberculous disease—an impression which I have reason to know too often leads to faulty treatment.

DISTRIBUTION AND CHARACTER OF STIFFNESS.

Distribution of the Rigidity.—This may involve the whole length of the spine or may be confined to limited areas, *e.g.*, the lumbar, dorsal, or cervical regions separately; in rare cases two distinct areas, *e.g.*, the cervical and dorso-lumbar, may be involved, the intervening parts of the vertebral column retaining their suppleness.

The Characteristics of the Stiffness.—(1) The stiffness may be absolute—that is to say, the spine or the portion of it involved may be rigid like a bar of iron, even when the patient is anæsthetised. (2) The stiffness may be ‘sub-absolute’—that is to say, complete in ordinary circumstances, but disappearing under the influence of an anæsthetic, the rigidity recurring upon the recovery from the anæsthesia.

(3) The stiffness, although at first apparently absolute, becomes, upon proper examination, modified, with the result that the spine begins to 'give' in a succession of jerks in consequence of the stammering of the muscles—a condition which I have ventured to call the 'stammering spine.' (4) The stiffness may be, as indicated in the table, persistent, intermittent or relapsing, and temporary or transient.

PERSISTENT STIFFNESS.

Absolute Rigidity.—This may be divided into two varieties, that which is unaffected by the administration of an anæsthetic, and that which disappears under anæsthesia. These cases may again be considered under two heads—those occurring during adolescence and under the age of twenty-five, and those occurring later in life. In the former, if the rigidity persists under anæsthesia, the cause is probably either tuberculous disease or congenital peculiarity. In tuberculosis other symptoms are generally sufficient to settle the question, but it is a mistake to suppose that the rigidity of tuberculosis is always associated with pain or tenderness, as sometimes both symptoms are wanting.

It is somewhat surprising that congenital stiffness of the spine, affecting almost invariably the lumbar

or dorso-lumbar region, is so little recognised, as it is not altogether rare ; the importance of a proper estimate of it is obvious. The following example is sufficient to show this : Whilst a girl eight or nine years old was taking her bath her mother thought that she moved as if her back was stiff, and therefore sought advice of a medical man, who found complete immobility of the vertebræ in the lumbar and lower dorsal region without any deformity. The child seemed perfectly well, had been playing hockey and other games, and showed no signs of any defect. At the same time the rigidity was naturally a cause of anxiety, and the patient was referred to me. Upon examination the lumbar spine was absolutely rigid, there was neither pain, tenderness, nor deformity ; in walking there was a slightly peculiar gait, unnoticeable under ordinary circumstances. Having seen cases before of the same kind, notably one recorded in the 'Clinical Journal' of November 11, 1903, I at once suspected the cause of the condition, and, upon examining other members of the family, found the same peculiarity in two of them. The importance of recognising such a condition is clear, as failing such a recognition the temptation to err on the side of safety by treating a case of the kind as one of tuberculosis would be very strong. In a case, therefore, of stiffness of the spine without pain or deformity in a young subject, I never fail to inquire

carefully into the condition of the spines of other members of the family.

In the absolute stiffness of old people, osteoarthritis or spontaneous ossification may, in the absence of other distinct indications, be assumed to be the cause, due allowance, of course, being made for the rigidity being possibly due to cured conditions (*e.g.* tubercle) in early life.

A CHARACTERISTIC CASE.

In the intermediate period between adolescence and old age a variety of causes such as those enumerated in the table may account for the condition, and the clinical symptoms are generally sufficient to prevent any mistake in the diagnosis. The revelation of the *x*-rays in injury to the cervical spine makes it clear that fracture of the spine, principally affecting the laminæ, but sometimes involving the bodies, ending in recovery, is more common than has hitherto been supposed, and that such cases are followed by stiffness, which varies, of course, according to the severity and distribution of the injury. I have at the present time a case under observation which illustrates this condition well; the patient is a man approaching 35 years of age, and the cause was a hunting accident. In persistent stiffness following injury traumatic myositis ossificans must not be

overlooked as a cause, as although the disease does not, of course, affect the spine itself, the conversion of adjacent muscle into a calcified mass may cause a rigidity as firm as if the spine itself were involved. The following is a characteristic case:—A man 35 years old slipped downstairs in running to catch a train. Although a good deal shaken, he went about his business at once in the ordinary way, but was unable to resume it on the following day in consequence of the pain in his back ‘across the kidneys’—he seems to have been laid up for some months, ‘on and off,’ but finally got sufficiently well to do what was absolutely necessary in the way of getting about—his back, however, always remained stiff, bending being difficult and in wet weather painful. For this stiffness he consulted me some three years after the accident, not having previously seen a medical man for about two years. On examination the spine was absolutely stiff over the lumbar region, the dorsal portion being supple. There was no pain, tenderness, or any visible abnormal condition, but on the right side of the lumbar spine, corresponding in outline and situation to the quadratus lumborum muscle, over which the erector spinae seemed harder than usual, was a mass of stony consistence, quite insensitive and absolutely fixed; the lumbar spine and the mass moved as a solid whole. The *x*-rays showed an opaque area

corresponding to the mass mentioned, the nature of which admitted of no doubt. Nothing, of course, could be done beyond telling the patient to make the best of the situation and to get as much compensatory movement in the parts by means of exercise as was feasible. I afterwards heard that a diagnosis of malignant growth had been made, but this was obviously the result of either an imperfect examination or because the practitioner concerned had previously had no experience of such cases. These masses, resulting from traumatic myositis ossificans, are, in some respects, it is true, suggestive of a growth ; indeed, operations have been proposed in some cases in consequence, but to any person familiar with the condition the mistake is not likely to occur.

A CLINICAL SIGN.

The Stammering Spine.—In the condition referred to in the foregoing remarks the rigidity is so complete that there is little probability of any mistake occurring. There is, however, a form of persistent rigidity which, although only apparent, is at first sight so absolute that unless an examination of the right kind be made, errors in diagnosis are more than probable. This form of rigidity is due to muscular contraction or spasm, and is most frequently met with in muscular rheumatism,

hysteria, neuro-mimesis, and as a consequence of reflex irritation (*vide* table), and so complete sometimes is the fixation of the vertebræ that a condition of absolute rigidity is produced. Bearing in mind the essential factor—muscular contraction—in these cases, it is obvious that any method of examination of a rigid spine should be made with a view to eliminate the question of deception from this condition.

Excepting cases of inflammation, congenital abnormality, or central nervous disease, it will be found that when stiffness of a joint, vertebral or otherwise, is due to muscular spasm, relaxation of the muscles concerned for a longer or shorter period is merely a question of putting strain upon them for a sufficiently long time. The relaxation may be only momentary, but it will come, and however short the term of relaxation may be, it is sufficient to provide the key to the situation.

The administration of an anæsthetic would, of course, at once settle the question of the relation of muscular spasm to the rigidity; but it should be borne in mind that the anæsthetic, although it may set at rest the question of rigidity, often veils, for the time being, other symptoms of importance. Moreover, the administration of an anæsthetic unnecessarily is not to be commended. In the examination to determine the points under discussion, all that is

necessary is that the patient, stripped to the hips, standing with the back to the observer, should bend forward in the usual way, the lower limbs being kept extended at the knee ; the hand of the observer at the same time resting upon the rigid portion of the spine. The bending forward of the trunk having been carried out as far as possible, the patient should not immediately begin to resume the upright position, as is usually done in the examination of spinal cases, but should maintain the bent position for a considerable period, at all events for two or three minutes. It will then be found that if the rigidity is due to muscular action, a slight quivering of the muscles lying under the hand of the investigator will occur ; this quiver will, if the bent position be still maintained, be replaced by a series of jerks (stammering), until in some cases the flexibility of the vertebral column can be freely established. In infants and the very young this method is obviously impracticable, but in such the same end is attained by resorting to the only delicate test of spinal rigidity available—namely, by placing the small patient flat on the back and lifting it off the couch or bed by one hand placed beneath the spine ; when held up in this way for a minute or so, if the rigidity is due to muscular causes, the result mentioned will follow. So far as I know, this method of testing the rigidity or flexibility of the spine of infants or very young

children is the only truly reliable one. The method of placing the child in the prone position and moving its lower limbs and pelvis from side to side is far less sensitive. I know of no more important point in the diagnosis of rigidity of the spine than that afforded by the 'stammering spine,' and it is a point which may altogether escape notice if the patient, whilst being examined, is allowed, after bending in the orthodox manner, to resume the erect position immediately.

SOME ILLUSTRATIVE CASES.

A boy, just passing from the adolescent period, of a markedly neurotic type, and the offspring of somewhat 'highly strung' parents, was reported to have had a slight accident in the football field, followed by some pain and stiffness in the lumbar region. He apparently recovered, but as he walked rather stiffly and became easily tired, he was seen by a medical man, who, finding rigidity of the spine, came to the conclusion that the lad was the subject of tuberculous disease, and advised complete rest on the back for a period of twelve months, to be followed by the use of a spinal jacket. As this rather drastic suggestion came upon the parents as a complete surprise, they were reluctant at first to resort to the treatment without the support of a

further surgical opinion. The physician concerned in the case consequently referred the boy to me. Upon examination, he was found to be an elongated 'weedy' looking subject, obviously still suffering from the nervousness of adolescence ; discomfort in the lower part of the back was complained of, and he tired very quickly after exertion ; he preferred to rest or loll on a sofa, &c., rather than to exert himself, on the grounds of the discomfort, sometimes amounting to pain, which followed any but the slightest efforts at movement. The whole of the lumbar and dorsal spine was stiff ; at first sight absolutely so, but upon applying the test I have described a distinct quivering in the erector spinae soon commenced, and the typical stammering movements followed. Further careful examination having failed to elicit any other evidence whatever of tubercle, I advised massage and rational exercise under proper supervision ; these were subsequently carried out, with the result that in a couple of months the boy was sound and strong. He went at once to a public school, and never ailed anything afterwards, although it is some years since the treatment was carried out. It is clear that in this case a knowledge of the stammering symptoms in rigidity of the spine prevented the adoption of a treatment of long-continued confinement and rest, which from every point of view would have been bad.

A middle-aged man, who came of a tuberculous stock, complained of a very intractable kind of lumbago, which persisted so long as to become a serious obstacle to business. Upon examination the lumbar spine was apparently quite stiff, and remained so during the ordinary test of bending with immediate return to the erect position. The *erectores spinæ* were very hard and rigid. Under the stammering test, however, the usual quiver in the muscles, followed by subsequent jerkings, was felt. The question of tuberculous disease having been thus eliminated the patient was sent to a continental watering-place and returned in good health. The occurrence of this symptom of stammering may be held to be absolute proof of the absence of organic disease of the vertebral column.

THE STAMMERING JERK.

It is interesting to note, although I do not know that the fact is of any special clinical value, that in the stammering spine the jerks occur in two forms—in the one the first jerk, which is brief, is followed by a succession of increasingly long relaxations in the muscles until sometimes a condition of nearly natural suppleness is arrived at. The process may, in fact, be diagrammatically expressed by the following markings :

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In the other form the first muscular relaxation is long, those which succeed becoming shorter and shorter until, in some cases, a condition of apparently complete rigidity may be resumed, the dia-grammatic expression being thus :

The former type is, so far as I know, limited to cases of 'hysteria' and neuro-mimesis ; the latter is mainly confined to cases of rheumatism and recent sprains and wrenches.

INTERMITTENT OR RELAPSING STIFFNESS.

Neuro-Mimesis in Relation to Spinal Rigidity.—Neuro-mimesis, the nervous mimicry of disease, does not, I fancy, attract so much attention now as it did twenty or twenty-five years ago, although, judging from personal experience, it is quite as important a clinical factor now as it was then. I may, perhaps, be pardoned if I remind you that the so-called intelligence displayed by young children is largely due to the results of pure imitation, and that during the early years of life the tendency, especially in girls, to imitate the characteristics and peculiarities of those with whom they continually associate is very strong ; this imitative faculty being particularly attracted in certain subjects by any characteristic which is especially pronounced. Occasionally it

happens that an unusually susceptible child, thrown constantly in contact with another individual, whether child or adult, suffering from some deformity or peculiarity, will unconsciously imitate the peculiar characteristic in a remarkable way. The commonest conditions thus imitated are, in my experience, disease of the hip and Pott's disease. Confining ourselves to the consideration of the subject of this lecture, I have seen cases of slight angular curvature at the cervico-dorsal junction so accurately imitated as to deceive very shrewd observers. A peculiarity, however, of the spurious condition is that it occurs in precisely the same position, and assumes as nearly as possible the same characteristics, as the original case, whereas in the case of organic disease, especially tubercle occurring in a second member of the same family, it is very rarely indeed of precisely the same form and distribution as the first—the very similarity of the two cases should, in fact, arouse suspicion as to the reality of the second. The stammering test will also invariably exclude the existence of organic disease, and if any ultimate doubt remains, the administration of an anæsthetic will finally settle the question by completely removing the rigidity if the case be one of the spurious kind. The moral of this matter is as follows: In a case of rigidity of the spine with, perhaps, apparent slight deformity, the mere fact that another member of the family has

had tuberculous disease of the vertebral column is not necessarily any evidence that the second case is of the same nature, especially if the manifestations in the second case are precisely similar to those in the first; in such circumstances the possibility of neuro-mimesis should always be borne in mind.

AN INSTRUCTIVE CASE.

Some years ago a girl fourteen years old was brought to me for an opinion concerning a curious stiffness about the neck and shoulders, and a peculiarity in gait which she had gradually developed in the course of eight or nine months. The attitude was singularly restrained—the head was thrust a little forward, the chin being slightly raised; on turning from side to side the head moved with the shoulders and the neck seemed quite stiff. The general attitude was precisely that of Pott's disease in the cervico-dorsal region. The girl was well nourished, very intelligent, and in apparently good general health. She complained of no actual pain, but readily became tired, and had given up any attempt to play games. On removing the clothes the position of the head and neck was as already described, the lower cervical and upper dorsal spine was apparently quite stiff, the vertebra prominens projected much more than is usual (which suggested a

condition of slight angular curvature), there was no tenderness or thickening of any kind, the bony outlines could be clearly made out, and the ordinary bending test only confirmed the impression of stiffness of the column. The stammering test I did not use, as I had not then become acquainted with it. I felt, however, that there was something deceptive about the case, and therefore examined the child under an anæsthetic, with the result that all the symptoms disappeared, the spine becoming during the anæsthesia entirely natural, whilst upon recovery from the anæsthesia the abnormal condition was resumed. What the condition during ordinary sleep was I do not know, as so far as I can recollect I never had an opportunity of satisfying myself on that point. The case puzzled me a good deal at the time; there was clearly no organic disease, and as a hysterical manifestation it was most unusual. It transpired on further inquiry that the girl had for a year or more before I saw her been constantly in the company of a patient who had tuberculous disease of the cervico-dorsal spine, and who wore a leather support having a collar round the neck to support the head and chin. This appeared to settle all doubt as to the nature of the case, which was one of nervous mimicry of the most striking kind. The position in which the patient held her head was, it will be noted, precisely that in which the head

of a patient would be whilst wearing a spinal support of the kind mentioned. Removal from the associations under which the abnormality developed, and the use of massage and rational exercises, were followed by great, although somewhat slow, improvement.

The recognition of these cases is of considerable importance, for unless proper means are taken to correct the perverted function the abnormality may become permanent, a result which is all the more likely if in such a case a diagnosis of organic disease be made and the usual treatment by rest and fixation employed. There is no limit to the eccentricities which are shown by some of these patients. I remember a remarkable case at St. George's Hospital, in which a clearly neuro-mimetic talipes equino-varus in a girl disappeared under an anaesthetic and was found on the recovery from the anaesthetic to have been transferred to the opposite foot; the mistake, however, was not long in being corrected, for in a few hours the abnormality was again located in the foot originally concerned.

REFLEX IRRITATION AS A CAUSE OF INTERMITTENT SPINAL RIGIDITY.

The reflex disturbances resulting from intestinal worms in children are so manifold as to be almost

unlimited ; at the same time I do not know that occasional spinal rigidity is generally recognised as one of them. There is no doubt, however, that intestinal worms do produce this complication, and sometimes in a very alarming degree. A case, for example, came under my notice in which a relapsing spinal rigidity of a very pronounced kind disappeared entirely after the passage of a large mass of tape-worm.

Movable Kidney.—The following case speaks for itself. A young woman, twenty-eight years old, of a spare and apparently healthy habit, suffered almost continuously from pain across the lower part of the spine ; the pain, as a rule, was dull, but sometimes it became acute ; stooping was so painful that she found it as a rule almost impossible to pick up any object from the ground. Upon examination the whole spine below the middle of the dorsal region was stiff when she bent ; there was neither deformity nor tenderness, but the *erectores spinæ* were very hard. The stammering test could not be applied as the pain on stooping was too great to allow the necessary attitude to be maintained for a sufficiently long time. On examining the abdomen the *recti* were rather rigid, and at first resented handling. A little gentle manipulative massage, however, led to their relaxation, and on the right side a distinct mass could be felt, which suddenly

slipped away in the characteristic manner of a movable kidney. This was followed by a sense of relief like that which was usually felt when sudden or rapid modification in the symptoms happened. It therefore seemed pretty clear that the whole trouble might be due to a movable kidney which was prevented from returning to its normal site by some band or constriction after it had become displaced. At all events the probability of this view being correct was strong enough to justify the recommendation of an operation to fix the kidney. This was accordingly done, with the result that no further spinal symptoms had occurred up to the time when she was last seen—three years after the operation.

CALCULI AS CAUSATIVE FACTORS.

Renal Calculus.—Spinal rigidity, generally of the relapsing type, is met with in cases of renal calculus. I was consulted by a medical student, twenty-four years old, on account of a persistent pain in the spine over the dorso-lumbar region, which varied in degree from a dull ache to an acute agony ; it was increased by movement, especially jolting. There was no tenderness or deformity, and violent succussion of the shoulders caused no increase of discomfort ; on the right side the pain passed round the belly ‘like half a girdle.’ When I first saw him the lower

half of the vertebral column was quite stiff in all movements, and he walked in the constrained manner of a man with a stiff spine. The stammering test led to a quivering in the erector spinae, but the pain was so much increased by stooping that the test could not be fully carried out; but what I felt was sufficient to assure me that no organic disease of the spine existed. There were no symptoms referred to the kidney, and the urine was normal saving the existence of a few crystals of oxalate of lime. A week later, although the symptoms of pain, &c., were much the same as before, the spine was quite supple and the constrained gait in walking, which was present before, no longer existed. The renal region now was a little tender, and the muscles resented pressure to a slight extent. In five successive examinations the spine was quite stiff in two, quite supple in three. In the renal tenderness no change occurred, and the urine remained normal. An *x*-ray exposure was made, and there seemed to be an opacity in the right kidney, but the case occurred in the earlier *x*-ray period, and the result was too indefinite to be conclusive. I finally explored the right kidney and removed an oxalate of lime stone as large as a hazel nut. The operation proved entirely successful, as all the symptoms disappeared and did not recur. The patient had unfortunately, in attempting to relieve the pain,

contracted the morphia habit before I saw him, and the ultimate result was lamentable.

Stone in the Ureter.—Within the last eighteen months I have seen a remarkable case of this kind in which spinal rigidity and pain were the conditions complained of. The patient was a stoutish, middle-aged man, of an obviously gouty habit. The pain, which was constant, was referred to the lumbar region, and was at times intense. When first seen, rigidity of the lumbar spine was apparently complete, and the lower dorsal vertebræ moved less freely than was normal. The stammering test established the fact that there was no organic disease of the spine. On one occasion the rigidity was altogether absent. The *x*-rays showed a stone of small size in the ureter. This, under the flushing-out treatment, was subsequently passed, and the symptoms complained of did not occur again.

TEMPORARY OR TRANSIENT RIGIDITY.

It is manifest that transient rigidity may arise from several conditions affecting the vertebral column apart from those the result of reflex causes. The only cause, however, which I need mention here is rickets. The general belief that the rickety spine is a supple spine is universally taught, and rightly so ; but it is nevertheless a fact that during the gastro-

intestinal disturbance in rickets the spine may for a period be rigid.

In conclusion it may not be amiss to remind you that whilst on the one hand spinal rigidity is not necessarily an indication of disease of the vertebral column, its absence, on the other hand, does not show that the column is free from lesion, since in some cases of tubercle considerable changes in the condition of the column may occur without its suppleness being interfered with.

LECTURE V

THE RATIONAL TREATMENT OF STIFF JOINTS BY
FORCIBLE MANIPULATION, COMMONLY CALLED
'BREAKING DOWN.'

In the previous lectures I have endeavoured to show the way in which stiffness and other disabilities of the joints arising from fractures and other injuries may be prevented. My present purpose is to indicate the rules which should be observed in the management of stiff joints generally upon principles which are rational, as opposed to the casual methods which have been hitherto not uncommonly used. Increased intelligent appreciation of the causes which lead to stiffness of articulations, and of the circumstances which influence them, has fortunately led to a more rational understanding among surgeons generally, and has enabled the ordinary practitioner to deal with these conditions in a manner which was quite unappreciated a few years ago. In using the term 'rational management' I mean management based upon reasonable principles, as opposed to the happy-go-lucky methods of the so-called bone-setters,

who, until recently, have practically had the monopoly of the management of cases of this kind. The term 'stiff joint' I wish to limit for my present purpose to those joints which are fixed by fibrous adhesions or matting around or in the vicinity of the articulation ; cases of bony ankylosis of course do not come under consideration in the present discussion.

Stiffness in a joint, therefore, in the sense in which I am now speaking, may be due to adhesions inside the articulation ; to stiffening of the capsule by adhesion, or matting of the parts immediately around it ; to temporary muscular rigidity, or to permanent rigidity of muscles, from physiological shortening, and finally to adhesion of muscles (*e.g.* in fracture) at a point more or less remote from the articulation.

The first object in any case in which 'breaking down' of a stiff joint is contemplated is to ascertain whether there is, or whether there is not, bony ankylosis. This can generally be easily ascertained by examination under an anæsthetic, and as a rule without an anæsthetic, especially if the *x*-rays be used as a help. But the *x*-rays in themselves are apt to be extremely deceptive, and will sometimes show a joint to be apparently ankylosed which, under an anæsthetic, may, with a little discreet manipulation, be made to bend almost to its complete extent. On the other hand, I have seen a skiagram showing a joint apparently sound and in good working con-

dition which, when examined after amputation, was found to be absolutely ankylosed by buttresses of bone. The evidence of the *x*-rays, therefore, in the conditions which I am now considering, must not be regarded as above suspicion.

METHOD OF EXAMINATION.

In examining a joint in order to determine the degree of stiffness, taking for an example a knee-joint, because the knee is the articulation most commonly concerned and the one about which more mistakes are probably made than any other articulation, there are some practical details which may be worth pointing out, as they are of importance.

The main difference felt upon manipulation in a joint which is in a condition of bony ankylosis and one which is merely stiff from adhesions or matting is, of course, that the former is rigid in its stiffness like a bar of iron or wood, and the latter gives a sensation of 'spring' in the line of the joint on attempts at bending. In some cases the signs of the two conditions of true ankylosis and extreme rigidity from adhesions approach so nearly to one another that it is only by the most careful manipulation that they can be differentiated. It is by attempts at *flexion* alone of any joint that a reliable judgment in this respect can be arrived at; the

evidence of attempts at *extension* are nugatory and deceptive. In testing the rigidity of a joint by flexion the following points are essential to be observed in different cases : (1) The proximal bone must lie along its whole length upon a flat surface (*e.g.* a kitchen table) to which it can be firmly applied by pressure of the hands of an assistant or some other means. (2) The end of the flat surface must lie exactly across the middle of the affected articulation, so that when pressure is made upon the distal bone the stress of strain comes accurately upon the line of the joint. (3) The pressure upon the distal bone should be such as is likely to elicit the sense of 'spring' in the articulation most correctly ; to this end the distal bone should not be grasped in the hand and forcibly bent continuously, but the hand of the manipulator should merely be laid upon the distal portion of the limb and a decided but not too sudden impact given ; a sense of spring in the line of the joint will in this way be much more easily determined than by the firm grasp and forcible attempts at flexion usually employed, since the forcible attempts referred to are liable to convey a sense of spring which involves *not the joint alone but the whole limb.*

By the above method it is almost impossible to be deceived as to the nature of the stiffness even in the most difficult cases. In an ordinary way the following plan will suffice. One hand of the manipulator

should be placed on the flexor side of the joint, say, for an example, the knee, the limb being poised upon the hand thus placed ; the opposite hand taking the leg just below its middle, attempts are made to flex the knee whilst upward pressure is made by the hand which underlies the joint. Any material spring that there may be in the articulation will be felt immediately, *not by the hand which is on the leg, but by that which is beneath the joint.* By such a method of examination a very slight amount of spring in an articulation can be appreciated by any person possessing an average acuteness of sensation, and in a case of stiff joint in which there is a sufficient amount of spring to be appreciated in this way there is a strong chance, provided that the other conditions to which I shall refer presently are favourable, of a cure being effected by discreet forcible manipulations.

It is stated that a valuable indication of the existence of bony ankylosis on the one hand and mere stiffness on the other is the absence or presence of pain after violent manipulation under an anæsthetic, the subsequent occurrence of pain in the line of the articulation being held to be in favour of the absence of bony ankylosis. No reliance can be placed on this test, as in certain cases of bony ankylosis following upon tubercle manipulations are always followed by pain of variable severity. Of course, the proper

appreciation of minute differences in rigidity must to a great extent be dependent upon the delicacy of the sense of touch in the manipulator, but in a general way the distinction is not difficult.

POINTS FOR CONSIDERATION IN DECIDING UPON THE PROPRIETY OF 'BREAKING DOWN' A STIFF JOINT.

Having determined that the joint is in a condition in which the question of 'breaking down' may be legitimately considered—in other words, that the joint is not in a condition of bony ankylosis—the next point to be decided is whether the breaking down is practicable on the one hand and desirable on the other. With regard to practicability it may be at once conceded that any joint which has become stiff from any other condition than that of bony ankylosis can as a rule be broken down if sufficient force is used, provided that the anatomical relations of the parts are normal; but sometimes the strength of the adhesions is greater than the strength of the bone, in which case a fracture in or near the joint may occur instead of a breaking down of the adhesions.

In determining the desirability of the breaking down of a joint the following points require primary consideration:—1. The history of the case. 2. The condition of the articulation. 3. The state of the soft parts around the joint. 4. The condition of the

muscles acting on the joint. 5. The condition of the bones.

1. *The history of the case.*—This is important in relation to the causes of the stiffness. Speaking generally, cases in which the history points to tubercle, to inflammation during malaria, and to disorganisation following upon enteric and the exanthemata may be regarded as unfavourable for sudden breaking down ; cases, on the other hand, in which the history points to injury, rheumatism, pyæmia, osteo-arthritis, gonorrhœa, syphilis, and to various nondescript types of arthritis, may be regarded as favourable for the treatment, subject of course to the necessary modifications indicated by local conditions which will be dealt with presently.

2. *The condition of the articulation.*—The point of first importance here is that the relation of the articular surfaces should be normal, that there should in fact be no displacement, partial or complete. In the case of the knee the free mobility or fixation of the patella is of much moment, since, if the patella be fixed, the bone may be fractured during the bending of the joint, an accident which I have witnessed more than once ; if the patella is freely movable it is perfectly safe from injury during forcible flexion of the knee.

Apart from the conditions just mentioned, the joint may be of normal temperature to the touch or

it may be hot ; further, it may contain fluid in excess or it may not. A heated joint *without fluid* is the least favourable for radical measures, since such a joint usually contains a limited tuberculous focus which upon the breaking down of the joint is almost certain to become acute and diffuse. Moderate heat with effusion is no bar to radical measures, indeed is at times a strong indication for their adoption, since the effusion and heat are often due to the dragging of adhesions, which, if broken through, cease to trouble. All other things being equal, the less the rigidity of a joint the more favourable it is for treatment by immediate forcible flexion, provided that the defect is inside the articulation. In some cases, when the defect is extra-articular, it is otherwise.

3. *The state of the soft parts around the joint.*—Scars, sinuses, and general adhesion of the soft parts about a joint do not as a rule contra-indicate forcible bending, if these conditions are confined to the *extensor aspect* and if no nerve is involved in the cicatrices. Should the parts be reduced merely to a thin ill-nourished scar area, of course the risk of splitting this ill-nourished tissue must be borne in mind. Contracted scars and shortened normal tissues on the flexor side of a joint which has been for a long time flexed are very important, and if *the flexion is extreme* the propriety of extending the joint forcibly must be carefully weighed. As a rule in

such cases immediate forcible extension is contraindicated, gradual extension by the aid of massage and gentle passive movements being preferable in consequence of the tendency of the contracted skin and subcutaneous tissues to split transversely during violent extension. I well remember a remarkable case of this kind occurring in the theatre of St. George's Hospital. A patient, whose knee had been flexed for some years, was placed under an anæsthetic for purposes of examination, as the defective joint, for sufficient reason, had either to be straightened or removed. A somewhat forcible attempt to extend the limb was followed by considerable success, but the soft parts across the middle of the popliteal space split transversely, leaving the main vessels and nerves exposed. Amputation was immediately performed. This case is an extreme one, but illustrates the point under discussion. In fact it is true generally that forcible *flexion* of stiff joints is not only more successful than forcible *extension*, but is comparatively devoid of risk if intelligently practised. The most difficult cases of stiff joint of all to deal with in my experience are those in which a nerve (usually the ulnar at the elbow) is involved in a cicatrix outside the joint. The pain in some of these cases makes anything like forcible bending quite impossible unless the nerve can be freed from the cicatrix in which it is involved

—a measure which is sometimes impossible without producing paralysis, if it does not already exist, or increasing it if already present. I have under my care at the present moment a case of moderately stiff elbow from gun-shot wound, which so far as the joint itself is concerned is perfectly amenable to treatment ; but, in consequence of some sloughing which occurred at the inner side of the articulation, the ulnar nerve is so densely implicated in scar tissue that any material movement excites intolerable pain and temporary paresis. The case is practically outside the limits of active surgical treatment, since the nerve cannot be freed from its scar tissue without suffering considerable damage, and the remaining alternative, excision of the joint, does not promise a result sufficiently better than the rather stiff joint which now exists to make it preferable. This again is an extreme case, but it is none the less instructive, particularly as the case was sent for treatment solely from the point of view of the stiff joint, the importance of the nerve complication not having been recognised. It is always well to bear in mind in cases of stiff joint that some of the greatest pain during the radical treatment may arise from conditions apart from the joint itself.

4. *The condition of the muscles acting on the joint.*—The muscles in a case of stiff joint are naturally wasted more or less. The wasting may be slight

or extreme, and in the latter case the muscles on the proximal side of the joint may be reduced to a condition which is little better than that of fibrous cords. The wasting, whether slight or excessive, affects the proximal muscles mainly, *i.e.* the muscles which act directly on the joint under ordinary circumstances.

Speaking generally, the less the amount of mobility in the joint the greater is the wasting of the muscles, for obvious reasons. The wasting, however, is not always the same in similar cases, although these may be in all other respects apparently the same. From the point of view of the radical treatment of stiff joints by forcible bending, muscle *waste* in itself is not of great importance, but *rigidity of the muscles in addition to wasting* is of considerable consequence. Muscular rigidity in these cases arises mainly from two causes : first, physiological shortening from the effects of disease or persistent complete disuse ; and secondly, matting of the muscles or muscle to the underlying bones from inflammation or injury, as examples of which may be mentioned the adhesions resulting from cellulitis or periostitis, and the matting of the parts about a fracture. The more rigid the muscle the greater must be the care exercised in the forcible bending of these cases, and it is important to determine as far as possible to what extent, if any, the stiffness of the joint is due to the rigidity of the muscles. Speaking generally, it will be found that the

greater the rigidity of the muscles the less favourable are the cases for the radical treatment. Although muscular rigidity in itself is no actual bar to attempts at breaking down, these when rigidity is present should be made with great care, as not only may rupture of muscle occur, but, what is worse, a bone may give way (Plate XI). The explanation of the danger of the latter calamity lies in the fact that where a joint has been for a long period quite stiff and the muscles extremely wasted the bone is always to some extent wasted also, a very important fact in connection with the present discussion and one which I do not think is sufficiently recognised. In fact the condition of the muscles is a fair indication of the state of the bone in the matter of strength ; wasted rigid muscles indicate a weak bone, and *vice versa*.

5. *The condition of the bones.*—Beyond what has been already indicated there is little to be added under this head. Any obvious indication of bone weakness, such for example as loss of tissue, may in some cases altogether negative the propriety of breaking down a stiff joint, and in all cases should lead to great care in manipulation. On the other hand, it is well not to assume, because a bone, as sometimes happens, is thicker than usual from some pathological change, *e.g.* osteitis, that it is stronger than usual. Although as a rule bones so affected are stronger over



Skiagrams of an ankylosed knee-joint before and after ill-advised forcible flexion.

the actual area of the thickening, they are not always so immediately beyond, and I remember seeing a fracture of the femur in a middle-aged man which occurred during the breaking down of a knee-joint, the fracture having occurred at the extreme upper limit of considerable thickening of the lower end of the femur from old-standing osteitis. In this connection the tendency of a new growth to simulate simple bony thickening must not be lost sight of.

Assuming that in all cases the milder measures of massage exercises and passive movements have been tried without effect or with only partial success, the main points relating to the desirability or the reverse of resorting to the radical method of the forcible bending of stiff joints may be summarised generally as follows :—

1. The less the movements of the articulations are restricted the better is the prospect of the radical method.
2. Fibrous ankylosis resulting from tuberculous disease, unless very slight indeed, should not be forcibly broken down. If in such cases the joint be fixed in a position which is inconvenient or painful to the patient, rectification of the deformity should, in joints where such a course is possible (*e.g.* the hip), be effected by an osteotomy at some distance from the joint, and not by 'breaking down.'
3. A stiff joint which is hot to the touch whilst it

contains no fluid is unfavourable for forcible bending, the condition being usually due to tubercle in a quiescent but dangerous stage. Forcible bending in such cases is commonly followed by the lighting up of the quiet tubercle which results in abscess or worse developments.

4. A stiff joint which is hot to the touch whilst it *contains fluid* is not unfavourable for breaking down unless the ankylosis is practically complete, heat with effusion being commonly due in chronic incomplete stiffness to the dragging upon adhesions, the rupture of which cures the symptoms. If the ankylosis is complete, or nearly so, and there is coincident effusion and heat, breaking down of the joint should be conducted with great care and caution, as in such cases there sometimes exists a small area of diseased bone in the joint or immediately outside it.

5. Effusion without appreciable heat may be ignored for ordinary purposes in deciding as to the propriety of the forcible bending of a joint.

6. The less the muscles acting on the joint are wasted, and the better their physiological condition, the more freely, *cæteris paribus*, may attempts at breaking down be approached.

7. Rigid or adherent muscles should be regarded as unfavourable factors in this treatment, but are not insuperable objections.

8. Wasted muscles which are not rigid may be disregarded except in very long-standing cases, in which extreme muscle-waste is invariably associated with weakening of the bones ; such cases, therefore, should obviously be approached with caution.

9. The ideal condition of a stiff joint for the purposes of the radical treatment by breaking down may be said to be as follows : moderate stiffness, absence of heat and effusion, with flaccid muscles. Any joint which is not absolutely stiff, which is not hot to the touch, which contains no fluid, and in which the muscles acting upon it are not rigid or adherent, may be broken down with impunity.

10. The neurotic element in stiff joints must be borne in mind. Stiff joints which are without increased local heat and effusion may, *if the muscles are not wasted*, be regarded for practical purposes as neurotic in origin.

POINTS RELATING TO THE DETAILS OF FORCIBLE MANIPULATION OF JOINTS.

The following summary includes only the more important points relating to the method of procedure, and is of course in no sense exhaustive ; but the points referred to are, so far as my experience goes, those which are most worthy of note.

1. Although not invariably necessary, an anæsthetic should be given in all cases. The anæsthesia

should be profound, and the behaviour of the muscles of the affected part should be observed whilst the patient passes under the influence of the anaesthetic. The more these muscles twitch and contract during this period, the better as a rule is the prospect of the treatment. In neurotic cases free spontaneous movement of the stiff joint frequently occurs at this time.

2. All attempts at the breaking down of stiff joints should, unless circumstances make it impracticable, be preceded by a methodical course of massage and passive movement. This is especially indicated when the muscles are rigid and apparently adherent. The effect of a course of massage in such cases is most marked in loosening the rigidity of the muscles, which frequently leads to considerable diminution in the stiffness of the joint. Joints treated in this way often become easily manageable by breaking down after the massage, although they may have previously appeared almost hopeless.

3. The first forcible movement made in attempts at breaking down a joint should be *flexion*. Extension should never be employed as the first movement.

4. The opposing force across which the joint is bent should be placed *exactly in the line of the articulation, and not upon the bone immediately above that point*. When possible the whole length of the proximal bone, when it is a long bone, should be applied to a flat

surface, a table for example, the end of which, with a thick blanket laid over it, should be exactly in the line of the articulation. The proximal portion of the limb should be kept firmly applied to the flat surface by the hands of an assistant whilst the manipulator manages the distal part. In the case of the elbow and similar joints, the opposing force (the hand of the manipulator, or a padded bar) should be carefully placed in the flexure of the joint exactly in the line of the articulation.

5. The attempt at *flexion* should be made by means of steady *intermittent movements*, not by one sweeping motion. Extension should be made by one continuous pull or push, the same precautions being taken about the position of the opposing medium as has been indicated in speaking before of its use in flexion.

6. It is of importance that no attempt at extension should be made until after the greatest possible amount of flexion has been effected. In other words, the breaking-down process should be considered primarily to consist of two stages which are quite distinct, first flexion and then extension, the first being complete before the second is commenced—abduction and adduction, circumduction forming a third distinct stage in dealing with joints in which such movements are normally present.

TREATMENT SUBSEQUENT TO THE BREAKING DOWN
OF A STIFF JOINT.

On this matter there is little that requires to be said. Nevertheless, judging from what I see and hear of the subject, it is still necessary to emphasise the fact that no splint of any kind should be used after this treatment. Massage and passive movement should be used immediately, *i.e.* within twelve hours if possible. Voluntary movements should be encouraged as much as possible even at the cost of considerable pain. The only indication for the interruption of the movements is *extreme local heat* and tension of the joint; tension without material increase of local heat may be ignored. It must never be forgotten that the time during which adhesions which have been broken down are most inclined to re-form is in the course of the first three or four days after their rupture; it is during this time that free movements are most urgently called for, and this is the time that even now is wasted by some practitioners by confining the limb in a splint.

In difficult cases it is wise in the majority to give an anæsthetic again on or about the fourth day (not later), to be sure that the amount of mobility obtained at the first operation is really preserved.

In cases in which it has been found possible to

effect only a partial breaking down of a stiff joint, the succeeding attempts at getting a complete result should not be postponed too long. A week is the longest interval which should be allowed, in the absence of special circumstances, between the first and following attempts.

THE HYPERÆMIC TREATMENT OF STIFFENED JOINTS.

It is in connection with the treatment of stiffened joints that the method of induced hyperæmia usually associated with the name of Professor Bier, of Bonn, has in my experience proved of the greatest use both as a preventive as well as a curative measure. I am strongly inclined to the view, without being certain about the matter until it has been confirmed by further experience, that the tendency to stiffness and to the formation of adhesions in joint affections is less when obstructive hyperæmic treatment is used as an aid to massage or any other treatment which seems desirable, but it certainly will not take the place altogether of the various other means of treatment in vogue at the present time; it must, in fact, be regarded as an adjunct, and an excessively useful adjunct, to other treatment.

It will, however, I am sure, be found that in acute conditions like gonococcal arthritis, acute rheumatic arthritis, and the like, when the hyperæmic

treatment can be borne, as it usually can be, in the arterial, if not in the obstructive form, that the amount of massage and passive movement subsequently required to restore the normal joint functions is considerably less than when the ordinary methods have been alone pursued.

As an aid in the treatment of joints already stiffened by continued immobilisation, or by adhesions in and around the articulation, provided that these have not become too solidly organised, induced hyperæmia is of undoubted value—a fact in which there is nothing new, as I suppose it is the custom of most of us to prepare a stiffened joint for massage by the use of a very hot compress, with a view to what is commonly called ‘softening the parts,’ that is to say, to induce a flow of blood to them. This end is more perfectly attained by the hyperæmic method of Bier than by any other means, but care is necessary in selecting the form of application, obstructive or arterial, which is to be used. Speaking generally, if the part is painful, as, for example, in certain cases of stiffening after acute ‘rheumatic’ arthritis, arterial hyperæmia is more comfortable and efficacious than the obstructive form, especially if there is much thickening of the soft parts about the joint. Similar conditions are suitable for obstructive treatment by the somewhat elaborate exhaustion apparatus invented by Bier for the purpose.

Hyperæmia induced by bandage pressure is by far the most simple and convenient method, and answers well in cases of stiffening of joints without pain, especially if the surrounding induration or œdema is not great. Capital examples of the good results thus obtainable are afforded by cases of stiffness of the fingers (phalangeal joints) so frequently met with after injuries, generally called sprains, but often in reality fractures.

The comparative ease with which in such cases a finger can be manipulated and bent after its base has been encircled by an elastic band for a period varying from fifteen minutes to an hour or more, by which hyperæmia is produced, with the precautions which I have indicated, is often remarkable, although in common fairness it must be admitted that there is no certainty in this result, as in some cases the effect produced seems to be virtually nothing.

The most striking results of this method of hyperæmic induction have been in my experience obtained in stiffness of the knee-joint, a part which is in many ways particularly well adapted for the treatment, in consequence of the ease with which it can be applied and regulated. One of the most inveterate cases of recurrent stiffness of the knee after successive 'breakings down' of the joint which I have seen really showed no hopeful sign of cure until the obstructive hyperæmic method by bandage pressure was

adopted, when the tendency to recurrence steadily decreased, and recovery resulted. This case was also remarkable in showing the long period during which obstructive hyperæmia could be tolerated with absolute comfort, five or six hours being a common period, at the end of which general oedema below the bandage was well marked.

FIBRO-LYSIN IN STIFF JOINTS.

Injections of fibro-lysin have been recommended as a means of softening or loosening the adhesions in stiffened joints. I have not been able up to the present time to satisfy myself that the treatment is of material use.

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